Utah Department of Transportation

Performance Review of Electronic Collaboration with Engineering Partners

July 2005

Utah Department of Transportation

Performance Review of Electronic Collaboration with Engineering Partners

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Executive Summary

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A streamlined flow of information between the various stakeholders involved in the Utah Department of Transportation (UDOT) project delivery process is extremely critical to ensuring the overall efficiency of the process. Effective electronic collaboration between stakeholders both internal and external to the department provides better project status information for management, allows for easier sharing of design data, significantly reduces redundant and/or manual effort on the part of various stakeholders, and drives reduced administrative costs for both UDOT and its engineering partners.

This effective electronic collaboration and sharing of data is all the more critical given the hybrid nature of project teams (it is common for in-house units to perform some work on projects while external engineering consultants perform other work). For example, UDOT staff could perform bridge design or hydraulics work on a project while an engineering consultant works on the roadway design. Conversely, the roadway design could be performed in house with specialty work such as bridge, hydraulics, and geotechnical being outsourced.

In light of the importance of effective collaboration and information sharing among all project team members, UDOT has been evaluating the potential for increasing electronic collaboration and data sharing between UDOT and its consultant engineering partners.

Following are the four key objectives of this study:

- Conduct a high-level spot review of the current processes for sharing information between UDOT and its engineering consultants.
- Identify best practices nationally in this area among other state transportation agencies and private engineering firms.
- Compare UDOT's present environment against these best practices.
- Identify potential opportunities for improving electronic collaboration and data sharing between UDOT and its engineering consultant partners.

To meet these objectives, Dye Management Group, Inc. conducted focus group sessions and interviews with UDOT executives and stakeholders to understand the current processes (and supporting tools) by which UDOT project delivery staff collaborate and share information with consultant engineering partners. Focus groups were also facilitated with UDOT consultant engineering partners to understand both the engineering firms' current capabilities and their views on electronic data sharing.

Upon completion of the review of current processes for sharing information, the steering committee, which consists of management from both UDOT and engineering partners, asked the project team to focus on opportunities that promote the following:

- Project management efficiency:
  - Elimination of administrative tasks.
  - Efficient invoice review, approval, and payment process.
  - Simplified schedule updates and use of ePM.
  - Elimination of repetitive tasks.
- Virtual teaming, defined as an electronic means to collaborate with remote team members:
  - Reduce travel cost and travel time.
  - Concurrently share documents with remote team members.
- Use of electronic approval/signatures:
  - Eliminate manual approval processes.

To benchmark current practices, the team interviewed 10 state departments of transportation and four engineering firms to identify their approaches to electronic collaboration.

Based upon the benchmarking work, 14 recommendations were developed by the team. The recommendations leverage current technologies that exist within UDOT, as well as the purchase of inexpensive software and services. Some of the principal recommendations are:

- Optimize document sharing software to manage project documentation.
- Develop enhancements to ePM to achieve efficiencies in project management and to delegate project schedule maintenance to consultants.
- Use simple project software to track and manage small projects.
- Use an Internet meeting service provider, such as WebEx or Microsoft Live Meeting to achieve the benefits of virtual teaming.

The analysis and recommendations from this review will be used by UDOT to improve project management communication, allow for easier sharing of design data, reduce redundant and/or manual effort on the part of various stakeholders, and reduce administrative costs for both UDOT and its engineering partners.

This report presents Dye Management Group, Inc.'s findings, recommendations of opportunities to pursue, and high-level estimates on the time and cost to implement these recommendations, as well as the expected benefits.

I. Introduction

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The purpose of this review is to identify specific opportunities to enhance electronic information sharing between UDOT and its engineering consultants.

The analysis and recommendations from this research will be used by UDOT to improve project management communication, allow for easier sharing of design data, reduce redundant and/or manual effort on the part of various stakeholders, and reduce administrative costs for both UDOT and its engineering partners.

To meet these objectives, Dye Management Group, Inc. conducted focus group sessions and interviews with UDOT executives and stakeholders to understand the current processes (and supporting tools) by which UDOT project delivery staff collaborate and share information with consultant engineering partners. Focus groups were also facilitated with UDOT consultant engineering partners to understand both the engineering firms' current capabilities and their views on electronic data sharing.

Upon completion of the review of current processes for sharing information, the steering committee, which consists of management from both UDOT and engineering partners, asked the project team to focus on opportunities that promote the following:

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  - Reduce travel cost and travel time.
  - Concurrently share documents with remote team members.
- Use of electronic approval/signatures:
  - Eliminate manual approval processes.

In response to this directive, the Dye Management Group, Inc. team researched reasonable opportunities to improve collaboration and to reduce the administrative burden on UDOT project managers. The recommendations leverage current technologies that exist within UDOT, such as optimizing Bentley's ProjectWise to manage project documentation and developing enhancements to ePM to achieve efficiencies in project management. The only new technologies

recommended by this review require the purchase of fairly inexpensive solutions, which included an Internet meeting service provider, such as WebEx or Microsoft Live Meeting, to achieve the benefits of virtual teaming and the use of Microsoft Project to track and manage small projects.

This report presents Dye Management Group, Inc.'s findings, recommendations of opportunities to pursue, and high-level estimates on the time and cost to implement these recommendations, as well as the expected benefits.

A. Objective

A streamlined flow of information between the various stakeholders involved in the UDOT project delivery process is extremely critical to ensuring the overall efficiency of the process. Effective electronic collaboration between stakeholders both internal and external to the department provides better project status information for management, allows for easier sharing of design data, significantly reduces redundant and/or manual effort on the part of various stakeholders, and drives reduced administrative costs for both UDOT and its engineering partners.

This effective electronic collaboration and sharing of data is all the more critical given the hybrid nature of project teams (it is common for in-house units to perform some work on projects while external engineering consultants perform other work). For example, UDOT staff could perform bridge design or hydraulics work on a project while an engineering consultant works on the roadway design. Conversely, the roadway design could be performed in house with specialty work such as bridge, hydraulics, and geotechnical being outsourced.

In light of the importance of effective collaboration and information sharing among all project team members, UDOT has been evaluating the potential for increasing electronic collaboration and data sharing between UDOT and its consultant engineering partners.

Following are the four key objectives of this study:

- Conduct a high-level spot review of the current processes for sharing information between UDOT and its engineering consultants.
- Identify best practices nationally in this area among other state transportation agencies and private engineering firms.
- Compare UDOT's present environment against these best practices.
- Identify potential opportunities for improving electronic collaboration and data sharing between UDOT and its engineering consultant partners.

B. Approach

In order to understand the existing project delivery environment and to identify UDOT's current business objectives in terms of enhanced electronic integration between UDOT and

its engineering partners, the Dye Management Group, Inc. team performed the following activities:

- Reviewed existing UDOT documentation to gain an understanding of the current environment.
- Conducted six focus groups with UDOT stakeholders to understand the current processes (and supporting tools) by which UDOT project delivery staff collaborate and share information with consultant engineering partners. These focus groups were held with UDOT stakeholders representing the Office of the State Comptroller, project management, structures, consulting services, construction, and information services.
- Interviewed executives Jim McMinimee, Tracy Conti, and Charles Larsen to understand UDOT's vision for electronic collaboration.
- Conducted six focus groups with UDOT consultant engineering partners to understand both the engineering firms' current capabilities and their views on electronic data sharing. These focus groups were held with stakeholders in a cross-section of roles (project management, office management, information technology management, marketing, and accounting).
- Reviewed Dye Management Group, Inc.'s internal databases and vendor product literature to understand available electronic collaboration capabilities.

The Dye Management Group, Inc. team then reviewed best practices among both state transportation agencies and major engineering firms to benchmark UDOT's current operations and proposed business objectives against these best practices. Dye Management Group, Inc. worked with UDOT project management to determine which agencies and firms would be contacted. Benchmarking activities included:

- Reviewing transportation agency best practices. The team developed a structured interview questionnaire that was e-mailed to contacts in each of 17 state transportation departments. The team then followed up by telephone to conduct interviews with 10 agencies that chose to participate.
- Reviewing national engineering firm best practices. The team developed a structured questionnaire that was e-mailed to contacts in each of six engineering firms. The team then followed up by telephone to conduct these interviews with four firms that chose to participate.
- Documenting best practices and benchmarking UDOT operations and objectives against best practices. The team synthesized the information obtained from the best practices review to benchmark against UDOT's operations and business objectives. The team assessed how UDOT stands in comparison to best practices and presented the results of this assessment and a list of potential opportunities to UDOT management.

Finally, the team developed recommendations and an implementation strategy that identifies realistic actions that can be taken by UDOT and its engineering partners to improve electronic collaboration.

C. Document Organization

This document is the Performance Review of Electronic Collaboration with Engineering Partners. The remainder of the report contains the following sections:

- **Section II. Current Environment Review**. This section contains a summary of UDOT's current electronic collaboration environment. It also presents a summary of electronic collaboration opportunities as communicated by stakeholders from UDOT as well as from UDOT's engineering partners.
- **Section III. Benchmark Results.** This section contains benchmark results gathered through best practices interviews with other state transportation agencies and national engineering firms.
- **Section IV. Recommendations.** Based on the analysis in the previous tasks, the Dye Management Group, Inc. team developed a list of specific, actionable recommendations that UDOT can implement to enhance electronic information sharing and collaboration with external engineering partners. This section presents these recommendations.
- **Section V. Implementation Plan.** This section presents a high-level implementation plan for the proposed recommendations. This plan details a suggested sequence of activities and targeted time frames for implementing the recommendations. It also provides a high-level cost/benefit analysis for implementing the recommendations.
- **Appendix A.** This appendix contains a matrix that lists improvement suggestions from the perspective of the focus group participants. This appendix also contains a list of focus group and interview attendees.
- **Appendix B.** This appendix contains a detailed list of responses to the best practices questionnaire.

II. Current Environment Review

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In order to understand the existing project delivery environment and to identify UDOT's current business objectives in terms of enhanced electronic integration between UDOT and its engineering partners, the Dye Management Group, Inc. team performed the following activities:

- Reviewed existing UDOT documentation to gain an understanding of the current environment.
- Conducted six focus groups with UDOT stakeholders to understand the current processes (and supporting tools) by which UDOT project delivery staff collaborate and share information with consultant engineering partners. These focus groups were held with UDOT stakeholders representing the Office of the State Comptroller, project management, structures, consulting services, construction, and information services.
- Interviewed executives Jim McMinimee, Tracy Conti, and Charles Larsen to understand UDOT's vision for electronic collaboration.
- Conducted six focus groups with UDOT consultant engineering partners to understand both the engineering firms' current capabilities and their views on electronic data sharing. These focus groups were held with stakeholders in a cross-section of roles (project management, office management, information technology management, marketing, and accounting).
- Reviewed Dye Management Group, Inc.'s internal databases and vendor product literature to understand available electronic collaboration capabilities.

This section presents the major themes communicated by UDOT and its engineering partners to the project team. To facilitate presentation, these results are grouped by the following subject areas:

- Invoices and payments.
- Teaming.
- Project document sharing.
- Project management tools.
- Bid and contract document and data exchange.
- UDOT Web site.
- Infrastructure (network and security).

A matrix that lists improvement suggestions from the perspective of the focus group participants can be found in Appendix A. This appendix also contains a list of focus group and interview attendees.

A. Invoices and Payments

- Engineering firms would like to receive electronic payments, also known as direct deposits. This service is already available to state of Utah vendors. By enrolling engineering firms, UDOT will improve relations with these firms.
- Provide the capability for engineering firms to submit invoices to UDOT electronically. By doing so, invoices are received much more quickly and engineering firms are assured UDOT has received invoices.
- The timeliness of payments is dependent on UDOT project managers. Currently, engineering firms mail hard-copy invoices to their UDOT project managers. The UDOT project manager may not receive the invoice or may not take action in a timely manner.
- Comparing schedules against invoices is time consuming for UDOT project managers. To speed up the invoice package review process, UDOT project managers would like an exception report. To do this, invoices would need to be electronic.
- From the perspective of engineering firms, payment usually takes 30 to 70 days once the invoice has been delivered to the UDOT project manager.
- Invoices requiring local government signatures take longer to process. Currently, invoices are hand delivered, and when local government signatures must be collected, this delays payments.
- Invoicing requirements are inconsistent. Some UDOT project mangers require more detail than others.

B. Teaming

- To reduce travel time and expenses, and to collaborate with remote team members, UDOT and engineering firms would like to increase the use of videoconferencing and Internet meeting services. Most do not feel the need to see attendees. They would rather collaborate in real time on a document.
- UDOT project managers do not have visibility to consultant schedules, so it is difficult and time consuming to schedule meetings. Most consultants use Microsoft Outlook, while UDOT uses Novell GroupWise. Project managers spend a great deal of time researching team member availability and then scheduling meetings. By having access to consultant calendars, project managers could instantly see team member availability as they schedule meetings.
- Consultants would like to be considered part of the team. Most design consultants work remotely. Therefore, remote team members may not be able to collaborate with other team members on a design document.
- Videoconferencing is not available in all regions. Region 2 does not have videoconferencing capabilities.

C. Project Document Sharing

Project document sharing includes all documents shared by a project team such as design documents, project management documents, e-mails, and forms. For this section, the findings for design documents have been presented separately from the findings for other project documentation.

1. Design Documents

- Information redundancy. Both UDOT and engineering partners maintain design documents. Within UDOT, documents reside in varying central, regional, and project hardware and data repositories.
- Cannot work simultaneously on design documents. Remote team members would like the ability to collaborate in real time with other team members on a design document.
- Lacking version control and efficient communication of design changes. Iterations of design documents must be managed. This is difficult when documents reside in multiple locations or when multiple team members are working on their own copies of a document. Changes to design documents must be flagged and communicated to the team. It is important that everyone on a team is working from the same design documents.
- Difficulty accessing needed documents. This is due to the fact that documents reside in various locations. In addition, design documents can be quite large and difficult to e-mail. Some utilities have noted that it may take a few phone calls to UDOT to track down needed documents.
- As-builts must be developed and retained for future design. Consultants would like to see as-built documents. Many are stored electronically but on obsolete software. Consider converting as-builts to a contemporary platform. Also, as-built drawings are not managed well. Designs are transferred out to the field, where the construction team makes changes on a printout using a pencil. Construction does not have access to CADD. It might be possible to have consultants maintain electronic as-builts and return them to UDOT upon completion of the project.
- Consultants must manually submit documents to UDOT. Design files are usually too large to send via e-mail and other methods may not work smoothly, so consultants submit designs manually.
- iPlot conversion process is costly and cumbersome for consultants. Consultants and local agencies find it difficult to convert files using iPlot. This cumbersome task also represents an additional expense. It might be possible to have UDOT do the conversion, because iPlot is not a commonly used tool.

2. Project Documents and Data Exchange

- Replace paper submittal with electronic submittal. Forms must be printed and submitted manually. This is inefficient because information often already resides on the system. One example is screen 505.
- Electronic approval/signatures and work flow would improve the contract closing process. There are also forms that are walked around for signatures. Electronic signatures would eliminate the need to manually distribute forms for signatures.
- Utilities would like information on upcoming projects.
- Projects are referred to by a variety of numbers. Translation must be done by Comptroller's Office staff.
- Simplify access and maintenance of key information. Many documents exist on e-mail servers, which are lost when the server deletes old mail. The Hummingbird document management system has a very large file structure. UDOT would like to see a project folder and guidance on what information should be maintained on Hummingbird. UDOT has focused on how to use document management software but has not focused on the quality, organization, and maintenance of content.

D. Project Management Tools

Electronic Program Management (ePM) is the system used by UDOT that provides information on the planning, funding, scheduling, and staffing of UDOT design projects. The following findings reflect the perceptions of ePM in terms of its effectiveness as a project management tool:

- Local government projects are not tracked in ePM. Local governments would like projects tracked on ePM to ensure that they receive attention.
- ePM has poor performance in remote regions.
- ePM does not schedule well. It does a good job of tracking hours and payroll. ePM scheduling is not accurate because it is based on a design process that is no longer used, thus the algorithm is outdated.
- ePM is not accurate—it is based on a design process that no longer exists.
- Access to ePM is limited. Consultants would like more access. Consultants realize that it is a challenge feeding the ePM system with adequate information. There is not enough feedback from UDOT project mangers to know what ePM is telling them. There is no training on how to interact with ePM. This delays projects because there is no agreement on the critical path.
- ePM training is needed. Project managers would like ongoing ePM training.

- UDOT project managers must do all data entry into ePM for consultants. Schedules and updates from consultants must be entered into ePM by the UDOT project manager.

E. Bid and Contract Document and Data Exchange

- Proposal page limitations reduce a firm's ability to adequately respond to larger projects. Proposals are limited to six pages. This reduces a firm's ability to explain the different disciplines proposed.
- To determine the availability of proposed consultants for UDOT contracts, UDOT would like visibility to consultant staffing conflicts.
- UDOT would like electronic submittal of proposals for small projects. Engineering firms are concerned that this may compromise the quality of the proposal.
- Depending on the project, the UDOT project manger can take up to three months between project award and notice to proceed.
- Consultants doing repeat business with UDOT must complete the same forms for each project.
- Clarify bid package requirements to eliminate redundancies. There is some confusion as to what documents are needed (for example, Appendix B: Team Member Certifications).

F. UDOT Web Site

- There is quite a bit of information posted on the UDOT Web site. Consultants find it difficult to find the information they need without asking UDOT for help.
- Web paths are long and complicated. This makes finding information difficult.
- Communicate UDOT contacts to clarify UDOT responsibilities. There seems to be confusion regarding who is responsible for what.
- Make UDOT Web pages easier to navigate. The previous version of the UDOT Web site was perceived to be easier to navigate.
- Simplify access to key information. Not all manuals and forms are available in the same location. This makes it difficult for consultants to find forms. Explanations for each form would also be helpful.

G. Infrastructure (Network and Security)

- Improve access to UDOT systems for external and remote users. This would require firewall and security improvements.
- Improve the connection speed between regions.
- Improve access to the FTP site for consultants. Consultant project managers find it difficult to get through security for the server and uploading does not always work.

- Provide a common port to access needed UDOT applications. Users currently employ a variety of techniques and user ID accounts to access UDOT applications and data repositories. A single point of entry for users would greatly simplify access to UDOT applications.

III. Benchmark Results

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Based on results from the current environment review, the steering committee, which consists of management from both UDOT and its engineering partners, asked the project team to focus on opportunities that promote the following:

- Project management efficiency:
  - Elimination of administrative tasks.
  - Efficient invoice review, approval, and payment process.
  - Simplified schedule updates and use of ePM.
  - Elimination of repetitive tasks.
- Virtual teaming:
  - Reduce travel cost and travel time.
  - Concurrently share documents with remote team members.
- Use of electronic approval/signatures:
  - Eliminate manual approval processes.

This section represents the results of a nationwide research and analysis study related to electronic collaboration and information sharing with engineering partners. The project team contacted 17 state transportation agencies and six national engineering firms. Ten agencies and four firms chose to participate in this research effort. Participating transportation agencies and firms responded to an interview guide that covered the following subject areas:

- Electronic invoicing and payments.
- Virtual teaming.
- Project document sharing.
- Project management tools.

The following transportation departments participated in the best practices survey and interview process:

- Arizona Department of Transportation (ADOT).
- Colorado Department of Transportation (CDOT).
- Florida Department of Transportation (FDOT).

- Louisiana Department of Transportation and Development (LA DOTD).
- Maine Department of Transportation (MaineDOT).
- North Carolina Department of Transportation (NCDOT).
- New York State Department of Transportation (NYSDOT).
- Pennsylvania Department of Transportation (PENNDOT).
- Texas Department of Transportation (TxDOT).
- Washington State Department of Transportation (WSDOT).

The following engineering firms participated in the best practices survey and interview process:

- Carter & Burgess.
- HDR.
- The Louis Berger Group.
- URS Corporation.

Due to the diversity of topics, the project team often had to speak with more than one person at each agency/firm. Exhibit III-1 shows responses by subject area. Cells checked signify that the project team received a response from the state concerning the subject area.

Exhibit III-1: Responses by Subject Area

Agency/Firm	Electronic Invoicing	Virtual Teaming	Project Document Sharing	Project Management Tools
ADOT		●	●	
CDOT	●	●	●	●
FDOT	●	●	●	
LA DOTD		●	●	●
MaineDOT	●	●	●	●
NCDOT	●	●	●	●
NYSDOT	●	●	●	●
PENNDOT	●	●	●	●
TxDOT (headquarters only)	●	●	●	●
WSDOT		●		
Carter & Burgess	●	●	●	●

Agency/Firm	Electronic Invoicing	Virtual Teaming	Project Document Sharing	Project Management Tools
HDR	●	●	●	●
The Louis Berger Group	●	●	●	●
URS Corporation	●	●	●	●

A more detailed document that lists the response to each question can be found in Appendix B.

A. Electronic Invoicing and Payment

For this survey, "electronic invoicing" is defined as the process by which engineering firms can electronically submit and/or track invoices. This process eliminates the need to handle and track hard-copy invoices. It also provides "self-service" tracking of invoices by engineering firms. Electronic payment provides direct deposit of payments to engineering firms.

Survey participants were asked what tools or services they use to expedite engineering firm invoices and payments. A summary of responses can be found in Exhibit III-2.

Exhibit III-2: Electronic Invoicing and Payment Response

Agency/Firm	Electronic Invoicing and Payment Response
FDOT	FDOT has a Web-based Consultant Invoice Transmittal System (CITS) that allows access to the details of each contract and/or invoice.
LA DOTD	LA DOTD has an internal invoice transmittal and tracking system between LA DOTD engineering and fiscal sections. It does not allow for electronic payment.
MaineDOT	MaineDOT uses an internal invoice tracking system with a Web-based interface. This system ties to the financial system.
NYSDOT	The NYSDOT Contract Management Bureau is testing an NYSDOT-developed electronic invoicing application. This new application will provide a means for checking the consultant's invoice. After invoice approval, a paper copy goes to Contract Payments, where staff members re-enter key data to send the invoice electronically to the Comptroller's Office for payment. Currently, NYSDOT processes hard-copy invoices. The technical hardware and software exist to implement electronic invoicing and payments, but security has been a barrier to implementation.

Agency/Firm	Electronic Invoicing and Payment Response
PENNDOT	PENNDOT has a Web-based Engineering and Construction Management System (ECMS) that allows consultants to enter and track invoices. ECMS functions as part of an integrated solution for consultant selection, consultant agreement generation, and consultant invoicing. ECMS links to the state financial system (SAP) for electronic payment. Consultants are required to use ECMS.
HDR	HDR has a Web-based electronic system from PeopleSoft to send and receive invoices. Only a few of their clients nationwide use all-electronic invoicing.

B. Virtual Teaming

For this survey, "virtual teaming" is defined as an electronic means to collaborate with remote team members. Participants were asked to share methods and tools they use for facilitating meetings, scheduling meetings, and collaborating in real time on documents.

The project team learned that most states have limited virtual teaming tools. The most commonly used meeting tools are WebEx, Microsoft NetMeeting, and videoconferencing. The states queried did not have access to engineering partners' calendars. Real-time collaboration on documents was also limited. Some states collaborate on documents using videoconferencing or NetMeeting.

For virtual teaming meeting facilitation, the information gathered is displayed in Exhibit III-3.

Exhibit III-3: Virtual Teaming – Meeting Facilitation Response

Agency/Firm	Virtual Teaming – Meeting Facilitation Response
ADOT	ADOT uses videoconferencing. There are a limited number of videoconferencing locations, so the equipment is used infrequently.
FDOT	FDOT uses a Suncom videoconferencing network that allows for both multi-room and IP videoconferencing. This service is available to all state agencies, universities, community colleges, and local governments. Interactions with external users are limited due to homeland security, network security, and bandwidth issues.
LA DOTD and MaineDOT	LA DOTD and MaineDOT use videoconferencing. There are limited videoconferencing locations and they experience booking conflicts.
	Both agencies prefer to use Webcasts to videoconferencing.
NYSDOT	NYSDOT is implementing videoconferencing and operator attended conference calls. Their Office of Technology offers agencies teleconferencing and bridging services.
NCDOT, PENNDOT, and TxDOT (headquarters	These transportation departments use internal videoconferencing systems. They allow access for private firms.

Agency/Firm	Virtual Teaming – Meeting Facilitation Response
only)	
The Louis Berger Group, HDR, and URS Corp.	These firms use WebEx and Microsoft NetMeeting.

For scheduling meetings with virtual team members, the information gathered is displayed in Exhibit III-4.

Exhibit III-4: Virtual Teaming – Scheduling Meetings Response

Agency/Firm	Virtual Teaming – Scheduling Meetings Response
FDOT, LA DOTD, and URS Corporation	These organizations use IBM Lotus Notes to schedule internal meetings. LA DOTD also uses Domino, the Web component of Lotus Notes, for internal scheduling.
MaineDOT, NCDOT, and CDOT	These transportation departments use Microsoft Office tools for internal communications; communication with external parties is done using e-mail.
NYSDOT	NYSDOT has future plans to implement a Web-enabled scheduling system.
PENNDOT	Welcome Home is a Web coral that allows for collaboration between team members. It provides a common team schedule that can be updated. Meetings used to be coordinated via e-mail, which was cumbersome. Now all team members have access. Consultants have access through ECMS. Once consultants are in Welcome Home, they can see team schedules.
Carter & Burgess	Carter & Burgess uses Novell GroupWise.
The Louis Berger Group	The Louis Berger Group has Web sites designed for specific projects. They use Microsoft Office tools for internal communications and communicate with external parties via e-mail.

For sharing documents in real time with virtual team members, the information gathered is displayed in Exhibit III-5.

Exhibit III-5: Virtual Teaming – Sharing Documents Response

Agency/Firm	Virtual Teaming – Sharing Documents Response
ADOT	Each videoconferencing unit includes a personal computer for viewing electronic documents (e.g., PowerPoint presentations or CADD files). ADOT also uses Microsoft NetMeeting.
CDOT	CDOT is in the process of implementing Bentley's ProjectWise software, which will grant access to consultants to simultaneously view documents.
FDOT	FDOT uses e-mail and shared desktops via Microsoft NetMeeting.
LA DOTD	LA DOTD primarily uses e-mail to send documents to meeting attendees. An

Agency/Firm	Virtual Teaming – Sharing Documents Response
	electronic bulletin board is available to internal staff.
MaineDOT	MaineDOT's videoconferencing equipment allows for on-screen viewing of documents. It also e-mails or uses FTP to send documents to meeting attendees.
NCDOT	NCDOT has a videoconferencing system that allows for simultaneous document viewing and for switching between images and documents.
NYSDOT	NYSDOT e-mails documents to meeting attendees.
The Louis Berger Group	The Louis Berger Group uses WebEx and Microsoft NetMeeting.
URS Corporation	URS Corporation uses Autodesk Buzzsaw, and e-mail.

C. Project Document Sharing

For this survey, project document sharing includes all documents shared by a project team such as design documents, project management documents, e-mails, and forms. Participants were asked to describe how as-builts were maintained, methods used to electronically share project and design documents, and methods used to prevent duplication of documentation.

The project team learned that most states use the following methods to share documents:

- FTP sites.
- CDs (for large files).
- E-mail attachments (for small files).

Exhibit III-6: Project Document Sharing Response

Agency/Firm	Project Document Sharing Response
CDOT	CDOT uses FTP sites and e-mail for external communication of documents. Currently, ProjectWise is used for internal collaboration. This will be enhanced to allow simultaneous viewing with external parties.
FDOT	FDOT shares documents via e-mail and FTP sites. It also has an electronic document management system from DocuVantage that allows for information capture, document imaging, and document management. FDOT allows engineering partners to log in to its network. For CADD files, FDOT uses a product from Giffels Associates Limited called the Technical Information Management System (TIMS). This system is used by internal CADD production. To avoid overwriting files, the system provides file check-in/check-out capabilities.
MaineDOT	MaineDOT uses e-mail attachments and FTP sites. On one occasion, it used Bentley's VCON.
NCDOT	NCDOT shares documents through the use of e-mail attachments and FTP sites.

Agency/Firm	Project Document Sharing Response
NYSDOT	NYSDOT requires consultant-engineering firms to submit CADD files using ProjectWise. It uses Tran*port Expedite to share bidding data via the Internet during the period from advertisement to letting. It is piloting the distribution of bid documents on CD.
PENNDOT	PENNDOT has a solution that is based on the FileNet Panagon environment. It allows for the maintenance and management of road and construction documents. It includes version control, redlining, and edits on the original source files.
Carter & Burgess	Carter & Burgess has an internally written file sharing program that provides file check-in/check-out capabilities. Other methods used to share documents are e-mail attachments, FTP sites, and virtual private networks (VPN).
HDR	Depending on the complexity of the project, HDR uses FTP sites and ProjectWise.
The Louis Berger Group	The Louis Berger Group uses the client's selected software, which may include software such as LiveLink (Calligo), secure network folder systems Primavera Expedition, FTP sites, and e-mail attachments. For large projects, it has developed project-specific Web sites to allow for file sharing.
URS Corporation	URS Corporation uses Buzzsaw as a project collaboration tool. Once a drawing or document is posted on the project site, the system notifies those who need access to the information.

D. Project Management Tools

For this survey, "project management tools" is defined as methods or software used to develop and maintain project schedules, to track project budget, and to load resources. Participants were asked to describe project management software/tools they use, whether these tools improved project management efficiency, how satisfied managers were with the tools, and if any improvements were underway. In addition, they were asked if engineering partners are able to access and modify project schedules.

The project team learned that most states using commercial off-the-shelf project management software use the following:

- Primavera (for large projects).
- Microsoft Project (for small projects).

Exhibit III-7: Project Management Tools Response

Agency/Firm	Project Management Tools Response
CDOT	CDOT does not require private firms to use specific software. CDOT uses PROMIS accounting and PRODITS (scheduling) software that was developed in house. This software will be replaced by an enterprise resource planning (SAP) application.
	Microsoft Project is used occasionally to develop detailed schedules.
FDOT	FDOT uses Microsoft Project to develop schedules and perform resource loading. These schedules are shared using Microsoft Project team member lists.
LA DOTD	LA DOTD uses Primavera (SureTrak) for large projects and Microsoft Project for smaller projects. LETS is a secondary scheduling tool.
	LA DOTD is moving to a Project and Program Management System (PPMS) for budgeting and staffing activities.
MaineDOT	MaineDOT uses ARTIMS Automated Project View (APV) and Promis for scheduling and budgeting. An interface (Projex) ties APV with Promis (mainframe).
NCDOT	NCDOT has a Project Management and Maintenance Initiative (PMMi) that will be based on SAP.
	NCDOT has not contemplated giving consultants access.
NYSDOT	NYSDOT uses Microsoft Project.
PENNDOT	PENNDOT uses Open Plan 3.0 (OP30). The templates file provides project managers with tools for developing a project schedule. Auxiliary files include the work breakdown structure and organizational breakdown structure code files, the PENNDOT default calendar, and the PENNDOT resource file.
	The Joint Permit Application expert system (JPA) is used to prepare, submit, and review waterway permit applications for highway and bridge projects.
TxDOT (headquarters only)	TxDOT allows each region to use any tool it wants. The tools range from Microsoft Excel to Primavera.
WSDOT	WSDOT Urban Corridor Office and Washington State Ferries use Primavera. PS8 by Sciforma is used for scheduling and budgeting.
Carter & Burgess	Carter & Burgess has internal project management Web sites that are tied to the financial system to track budgets and schedules on construction projects.
	It also uses client tools such as Primavera, Microsoft Project, SureTrak, and Microsoft Excel.
HDR	HDR uses Microsoft Project for internal control. It also uses client tools such as Primavera, Microsoft Project, SureTrak, and Microsoft Excel.
The Louis Berger Group	The Louis Berger Group uses the Ares Corporation's Prism and Meridian Systems' ProLog for cost management. Constuctware and ProLog are used as collaborative project management systems.
	It also uses client-selected tools such as Primavera, Microsoft Project, SureTrak, and Microsoft Excel.
URS Corporation	URS Corporation uses client-selected tools such as Primavera, Microsoft Project, SureTrak, and Microsoft Excel.

IV. Recommendations

■

The recommendations presented in this section will be used by UDOT to improve project management communication, allow for easier sharing of design data, reduce redundant and/or manual effort on the part of various stakeholders, and reduce administrative costs for both UDOT and its engineering partners.

A. Electronic Invoicing and Payment

1. Encourage Engineering Firms to Participate in Direct Deposit Services Currently Offered by the State of Utah

Based on responses from engineering partners, the project team became aware that many engineering firms were not participating in the state's direct deposit service that is currently available to state vendors. We understand that UDOT already has moved forward with this recommendation by sending a letter to engineering partners reminding them of the direct deposit service.

Exhibit IV-1: Encourage Engineering Firms to Participate in Direct Deposit Services

Category	Recommendation
Process	• UDOT surveys engineering firms to see which firms are not participating in the direct deposit service. To save time, the direct deposit enrollment form and/or instructions are sent along with the survey. As part of the survey, the firms should be asked how to improve the direct deposit service. • Engineering firms respond to the survey and enroll in the service. • UDOT works with the Comptroller's Office or responsible party to ensure activation of the direct deposit service for interested engineering firms. • UDOT modifies contracting processes to provide engineering firms the opportunity to enroll in the direct deposit service upon completion of contract negotiations.
Policy	• Because this service currently exists, policy changes are not needed to implement this recommendation.
Technology	• The technologies that support the direct deposit service already exist within the state's financial system. No technology changes are needed to implement this recommendation.
Training	• Contract negotiators and/or administrators are made aware of the direct deposit service, so that they can offer the service to engineering firms upon completion of contract negotiations.

2. Give Engineering Firms Access to ePM to Submit Invoices Electronically to UDOT

This recommendation addresses the need to better manage invoices sent to UDOT from engineering firms. Firms will submit invoices electronically; by doing so, the firms will have immediate confirmation that the invoice was received by UDOT. This process will also allow UDOT project managers and Comptroller's Office staff members to better track, manage, and process invoices.

To clarify, the current state financial system cannot provide a means for vendors to submit invoices directly into the financial system. Therefore, this recommendation provides for the electronic submittal and communication of invoices to UDOT but not to the state financial system. The Comptroller's Office will ensure that all invoices from engineering firms are processed by the state's financial system.

Exhibit IV-2: Give Engineering Firms Access to ePM to Submit Invoices Electronically to UDOT

Category	Recommendation
Process	• Contract wording is modified to require electronic submittal of invoices by engineering firms. Upon completion of contract negotiations, engineering firms are provided instructions for submitting electronic invoices. If needed, this includes a user ID to access the invoicing submittal screen. • Engineering firms submit invoices to UDOT either via ePM or through a Web form. Once received by UDOT, the system sends a confirmation message back to the engineering firm. • Once the UDOT project manager has approved the invoice, the Comptroller's Office completes invoice entry into the state accounting system. This process is similar to the Comptroller's Office's current process, with the exception that the approved invoice is accessible electronically rather than from a signed hard copy routed to the Comptroller's Office. However, with the financial system upgrade in July 2006, there will be an ability to attach a Word or Excel document to a payment voucher. This will eliminate the need for an invoice to print to the Comptroller's Office. • If needed, after final invoice, the engineering firm's user ID is revoked.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• Develop a simple means for engineering firms to submit invoices electronically through ePM. Alternatively, UDOT may opt to have invoices submitted via a Web form. • Alter security logic to allow engineering firms access to the invoice entry screen or Web page. Security should also include an audit trail of all invoicing activities and the responsible parties. • Develop a means to notify the engineering firm, the correct UDOT project manager, and the Comptroller's Office when an invoice has been received. • UDOT project managers should be able to view invoices for their projects from

Category	Recommendation
	remote locations, such as project sites.
	• Comptroller's Office staff should be able to print an invoice for record-keeping purposes.
Training	• UDOT must develop training material for engineering firms, as well as for project managers and Comptroller's Office staff. This material should include instructions on how to submit an invoice, as well as online help and/or tutorials.
	• ePM support staff must be trained to manage engineering firm system access/security and to maintain the new electronic invoice software and data stores.

3. Track and Approve Invoices Through ePM

This recommendation eliminates the need for engineering firms to call UDOT project managers for information on the status of their invoices. By providing self-service visibility to invoice status via ePM or a Web page, UDOT project managers are freed of the responsibility to communicate invoice status with engineering firms. Status also includes the date and time an invoice is submitted to UDOT, reviewed by the UDOT project manager, approved by the UDOT project manager, and accepted by Comptroller's Office staff.

This recommendation also eliminates the hard-copy, manual invoice approval process by providing a means for UDOT project managers, UDOT executives, and Comptroller's Office staff to electronically manage and approve/sign invoices.

Exhibit IV-3: Track and Approve Invoices Through ePM

Category	Recommendation
Process	• UDOT must determine the new process by which invoices electronically submitted by engineering firms are tracked and approved. This includes defining how to record the status of each invoice as it proceeds through the process.
Policy	• State auditors must approve the use of electronic approval/signatures by UDOT project managers for electronic invoices.
Technology	• ePM is modified or a Web page is developed to provide a way for UDOT project managers to review and electronically approve/sign invoices only for their assigned projects.
	• ePM records and displays the status of each invoice as it proceeds through the UDOT approval process. Key users, such as UDOT project managers, UDOT executives, and Comptroller's Office staff are given authority to change the status and/or approve invoices as appropriate.
Training	• UDOT must develop training material that covers invoice status query, update, and approval. This training must be deployed to engineering firms, UDOT project managers, executives, and Comptroller's Office staff.
	• Comptroller's Office desk procedures must be changed to instruct Comptroller's Office staff how to handle electronic invoices rather than hard-copy invoices.

Category	Recommendation
	• ePM support staff must be trained to manage and maintain the new electronic approval/signature and status tracking software and data stores.

B. Virtual Teaming

Virtual teams are teams of people who primarily interact electronically and meet face to face occasionally. Examples of virtual teams include a team of people working at different geographic sites or a project team whose members telecommute. For UDOT, project teams may consist of co-located and remote team members from both UDOT and engineering firms.

Several benefits of virtual teams are:

- People can work from anywhere at anytime.
- Engineering partners are hired for their competencies, not just physical location.
- Expenses associated with travel may be reduced and sometimes eliminated.

One characteristic of virtual teams is that they are made up of people who communicate electronically. Some members may never meet in person.

Methods of communication for a virtual team include a central repository of information that is accessible via the Web. E-mail communications can be sent to the entire team via a team address. Virtual teams also meet via conferencing technologies that include the following:

- Audio conferencing—also known as teleconferencing, provided by phone companies as a service or product.
- Data conferencing—Microsoft NetMeeting, Microsoft Live Meeting, and WebEx conferencing services are good examples of multimedia group conferencing products. These services allow team members to share and collaborate using applications such as Word, Excel, Visio, and any other Windows-based applications. Chat and whiteboard are other supported functions.
- Videoconferencing—while audio and video over IP are built in, network bandwidth limits can constrain the quality of this service.

1. Use the Internet to Facilitate Meetings

This recommendation provides a means for remote project team members to hold ad hoc meetings, thus improving project communications, reducing travel costs, and concurrently viewing documents.

Exhibit IV-4: Use the Internet to Facilitate Meetings

Category	Recommendation
Process	• UDOT project managers use an Internet meeting service provider such as Microsoft Live Meeting or WebEx to facilitate meetings with remote team members.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• UDOT project management must work with ISS staff to select an Internet meeting service provider such as Microsoft Live Meeting or WebEx. The following activities will help evaluate these services: – UDOT gets an online demonstration of the Internet meeting services. – UDOT takes advantage of free trial periods offered by these services to test out the services on a typical project meeting. The meeting is hosted by a project manager with remote team members attending. This meeting should include document sharing.
Training	• Internet meeting service providers offer instruction manuals on their Web sites. UDOT should customize this material so that it is in an easy-to-read and accessible format for UDOT staff. • To incorporate use of Internet meeting services with UDOT's project management, confident users should assist others with the initial use of the service. • Project managers should also learn to negotiate lower travel budgets, requiring engineering firms to participate in Internet meetings rather than traveling to meetings.

2. Expand the Use of Videoconferencing to All Regions and to Engineering Partners

Although UDOT has videoconferencing capabilities, the capabilities are not available at all UDOT facilities and are not available for use by engineering partners. By providing videoconferencing capabilities at UDOT facilities, this recommendation eliminates time and funds expended by engineering partners to travel to meetings.

Exhibit IV-5: Expand the Use of Videoconferencing

Category	Recommendation
Process	• Project managers are given the authority to invite engineering partners to use UDOT videoconferencing capabilities for project-related meetings.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• Videoconferencing is rolled out to all UDOT regions.
Training	• Procedures for scheduling videoconferencing meetings are communicated to UDOT staff and engineering firms. • Instructions are developed and made available on how to use videoconferencing

Category	Recommendation
	equipment.

3. Share Calendars by Providing Engineering Firm Project Managers and Other Key Project Team Members with GroupWise E-mail Accounts

Currently, UDOT uses GroupWise software to manage e-mail and calendars. Most engineering firms use Microsoft Outlook. UDOT project managers would like to view the calendars of engineering partners in order to see their availability to meet. This capability would greatly reduce the time it takes for project managers to determine the availability of invitees and to schedule meetings. Research of the software market did not find a software product that links calendars from GroupWise and Microsoft Outlook that exist on different networks. Therefore, this recommendation is to expand the use of GroupWise accounts to key project team members from engineering firms. Some project managers at UDOT have given engineering firms GroupWise e-mail accounts for the duration of a project. By expanding this solution throughout UDOT, project managers will be able to easily schedule meetings. For engineering firms that use GroupWise, there should be the ability to fairly seamlessly share calendars. For engineering firms that do not use GroupWise, there will be a need to maintain two separate calendars, resulting in double entry.

Exhibit IV-6: Share Calendars

Category	Recommendation
Process	• Give key engineering partners GroupWise e-mail accounts with the understanding that the engineering partners maintain their GroupWise calendar and respond to e-mails and meeting requests in a timely manner. To simplify the process for engineering partners, they may have their GroupWise e-mail automatically forwarded to their own company e-mail accounts.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• GroupWise support staff must issue, monitor, and revoke GroupWise accounts for engineering partners.
Training	• UDOT GroupWise support staff must provide engineering partners instructions on how to use GroupWise. • If needed, contract procedures may change to require engineering firm project management to maintain a UDOT GroupWise account.

C. Project Document Sharing

1. Share Documents via Software

UDOT is currently piloting the use of ProjectWise software on three projects. It is recommended that UDOT evaluate ProjectWise and other document-sharing software with engineering firms for adoption. After selecting software, UDOT should develop procedures to manage and share project documentation.

Exhibit IV-7: Share Documents via Software

Category	Recommendation
Process	• Evaluate ProjectWise and other document management software. • Configure document management system to allow for secure, simultaneous viewing of documents with engineering firms. Maintain all project documentation on the same server. • Develop document-sharing procedures.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• UDOT currently owns ProjectWise software but may or may not use that as a platform for document sharing. • Additional technologies might be needed to allow access to engineering firms.
Training	• Train project team members on how to use the document sharing system.

2. For Smaller Projects, Standardize Document Sharing Procedures

UDOT has many repositories of information that could be of use to project teams. UDOT must assess critical documentation that must be shared with engineering firms.

Exhibit IV-8: Standardize Document Sharing Procedures

Category	Recommendation
Process	• For smaller projects, standardize procedures for sharing documents with engineering firms. • Survey engineering firms to determine their preferred document sharing method (e.g., CD, FTP site, e-mail). This might also include having all project documentation on the same server. • Develop and communicate a standard procedure to ensure version control and ease of communication.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• Existing technologies will be used.

Category	Recommendation
Training	• The standard procedures must be communicated and available to all project team members.

D. Project Management Tools

1. Consider Using Simple Project Software to Manage Smaller Projects

Considering the amount of time required to set up and maintain schedules on ePM, UDOT may want to consider using SureTrak, Microsoft Project, or other simple software to manage smaller projects.

Exhibit IV-9: Consider Using Simple Project Software to Manage Smaller Projects

Category	Recommendation
Process	• Use simple software such as SureTrak or Microsoft Project to track and manage smaller projects. • Develop criteria to determine if a project is small enough to use simple software. In these cases, the engineering firm can maintain the schedule. • Develop alternative project reporting procedures for program management.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• It is assumed that UDOT either has software licenses or those licenses will be obtained.
Training	• Provide software training for project managers. • Train project managers on any new program reporting requirements.

2. Provide Project Management and ePM Training

Various training needs were identified during this review. UDOT project managers communicated the need for more training, specifically in the areas of general project management and oversight skills, invoice package review and approval, and efficient use of ePM. Engineering firms would like UDOT project managers trained to provide consistent and equitable bid evaluations, contact estimations, and contract negotiations. In addition, if UDOT allows engineering firms to access ePM to maintain schedules and summit invoices, these firms will require ePM training.

Exhibit IV-10: Provide Project Management and ePM Training

Category	Recommendation
Process	• Update the project management skills training curriculum developed by Dye Management Group, Inc. for UDOT project managers. Training would include basic project management skills, bid evaluation, contract estimation and negotiation skills, schedule development, resource loading, invoice approval, and management of contracted consultant resources. • Develop ePM training for UDOT project managers and engineering firm project managers. • Initiate an ePM users group that meets regularly to resolve ePM issues, share best practices, and prioritize upgrade requests.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• Existing technologies, such as Microsoft Office products, can be used to develop and deploy training and course presentation materials. • Training materials are made available on the UDOT Web site.
Training	• All UDOT project managers should receive project management skills and ePM training. • All engineering partner project managers should receive ePM training before being issued user ID access to the ePM system.

3. Enhance ePM to Allow Engineering Firms Access to ePM to Submit and Maintain Project Schedules

Engineering firms would like access to ePM in order to maintain project schedules. If engineering firms could become proficient on ePM, then UDOT project managers would be relieved of the cumbersome tasks associated with establishing and maintaining schedules on ePM. However, because UDOT project managers are concerned about ePM logic and architecture, UDOT should improve ePM before providing engineering firm with access.

Exhibit IV-11: Enhance ePM to Allow Engineering Firms Access to ePM to Submit and Maintain Project Schedules

Category	Recommendation
Process	• Enhance ePM to allow access to engineering firms to submit and maintain project schedules. • Modify ePM to allow access. This will require security logic modifications within ePM. • Develop procedures to maintain security, provide access, and provide help desk support. • Work to improve ePM to better support project mangers.

Category	Recommendation
Policy	• No policy changes are needed to implement this recommendation.
Technology	• No additional technologies are needed.
Training	• Develop and provide training on ePM for engineering firm project managers.

4. Develop a Means via ePM to Report Exceptions Between Project Schedule and Invoice

After receiving an invoice package from an engineering firm, UDOT project managers must compare the invoice package reported hours to the agreed upon project schedule/plan. The project manager must reconcile differences with the engineering firm prior to approving the invoice. This task can be cumbersome. Some UDOT project managers are not sure what to look for when reviewing invoice packages.

It may be possible to streamline this whole process. During the project, there was discussion of entering hours and expenses into ePM based upon the negotiated proposal and then having invoices submitted on either a percent-complete basis or a milestone basis. At project close out, consultants could submit qualitative comments on what scope elements they felt had been over-budgeted and what elements were under-budgeted. Then comments could be entered into ePM to capture historical information for future use.

Exhibit IV-12: Develop a Means via ePM to Report Exceptions Between Project Schedules and Invoice

Category	Recommendation
Process	• Assess the feasibility to change the invoice process to either a percent-complete or a milestone basis. • Develop a means via ePM to report exceptions between project schedules and invoices. • To facilitate project management review and approval of invoices, develop a process through ePM to compare electronically submitted invoices to project schedules, and report exceptions.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• No new technologies are needed.
Training	• UDOT project managers will need training on how to use the exception report.

E. Other Recommendations

1. With Approval from Auditors, Continue to Develop Electronic Approval/Signature Capabilities and Procedures

Currently, UDOT is in the process of implementing electronic signatures for various documents. To eliminate inefficient and manual forms processing, UDOT should continue to develop electronic signature and forms approval capabilities.

Candidates include engineering firm invoices, advertising checklists, and concept reports.

Exhibit IV-13: Continue to Develop Electronic Approval/Signature Capabilities

Category	Recommendation
Process	• UDOT must identify forms that are candidates for electronic signatures/approvals. Forms that are routed to many people within UDOT are perfect candidates for this technology.
	• Once UDOT managers are comfortable using electronic signatures, UDOT might also consider implementing work flow logic to automate the flow of information to parties responsible for review and/or approval.
Policy	• UDOT should confirm that state auditors approve the use of electronic approval/signatures. The state auditor should give guidance on situations where electronic approval/signatures are not allowed.
Technology	• UDOT would expand its current electronic signature capabilities.
	• UDOT will need to convert paper forms to electronic forms.
Training	• Those with approval/signature authority will need instruction on how to add their electronic signatures to online forms.

2. Modify Contracts to Require Engineering Partners to Deliver As-Builts Upon Completion of Construction

Currently, as-builts are not maintained in a manner that provides sufficient reference to future design engineers. Redlining added by construction engineers is difficult to decipher.

Exhibit IV-14: Modify Contracts to Require Engineering Partners to Deliver As-Builts

Category	Recommendation
Process	• Modify scope of standard contracts with consulting engineering firms to include delivery of electronic as-builts upon completion of project construction. • UDOT must prepare a process and repository to accept and retain as-builts.
Policy	• No policy changes are needed to implement this recommendation.
Technology	• Technologies are not required to implement this recommendation. Engineering firms will generate as-built documents from their design documents using the same technology.
Training	• No special training is needed.

V. Implementation Plan

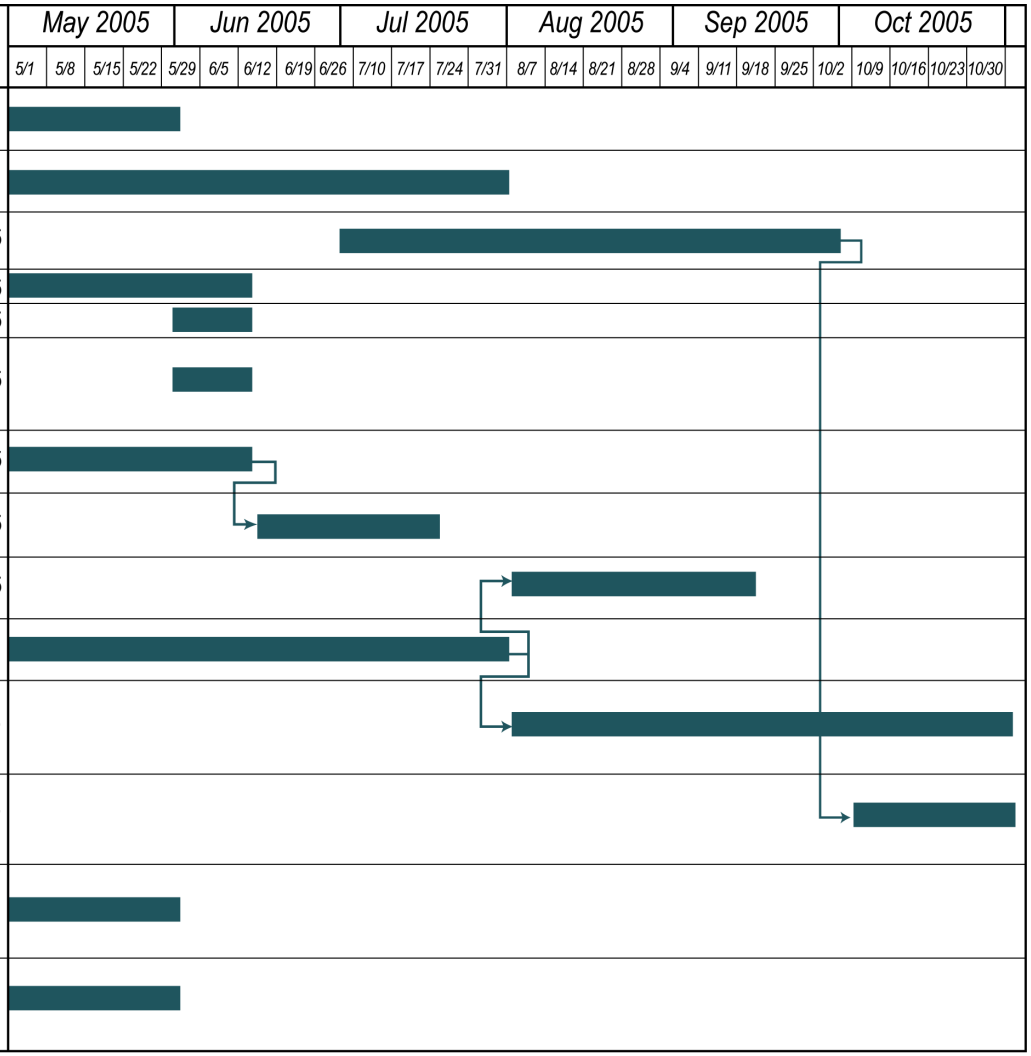
■

This section presents a Gantt chart, which proposes a timeline for implementing the 14 recommendations discussed in the prior section. In addition, high-level estimates of the time and cost to implement all 14 recommendations are presented, as well as the expected benefits of each implementation.

A. Schedule

Exhibit V-1: Implementation Plan Schedule – Gantt Chart

Recommendation	Priority	Start	Finish
Encourage engineering firms to participate in direct deposit service.*	Medium	5/2/2006	6/1/2005
Give engineering firms access to ePM to submit invoicing electronically.	High	5/2/2005	8/1/2005
Track and approve invoices through ePM.	High	7/1/2005	9/30/2005
Use the internet to facilitate meetings.	Medium	5/2/2005	6/15/2005
Expand the use of video conferencing.*	Medium	6/1/2005	6/15/2005
Share calendars by providing key team members from engineering firms GroupWise e-mail accounts.	High	6/1/2005	6/15/2005
Share project documentation via software.	High	5/2/2005	6/15/2005
For smaller projects, standardize document sharing procedures.	Medium	6/16/2005	7/18/2005
Use simple software to track and manage smaller projects.	Medium	8/2/2005	9/15/2005
Provide project management and ePM training	High	5/2/2005	8/1/2005
Enhance ePM to allow engineering firms access to ePM to submit and maintain project schedules.	High	8/2/2005	11/1/2005
Develop a means via ePM to report exceptions between project schedules and invoices.	Medium	10/3/2005	11/2/2005
With approval from auditors, continue to develop electronic approval, signature capabilities, and procedures.	Medium	5/2/2005	6/1/2005
Modify contracts to require engineering partners to deliver as-builts upon completion on construction.*	Medium	5/2/2005	6/1/2005



*Quick wins (projects that can be implemented quickly with minimal effort).

B. Electronic Invoicing and Payment

1. Encourage Engineering Firms to Participate in Direct Deposit Services Currently Offered by the State of Utah

Exhibit V-2: Encourage Engineering Firms to Participate in Direct Deposit Services

Estimates	Implementation Plan
Priority	• Medium
Estimated time to complete	• One month (elapsed time). • A UDOT staff member will spend approximately 40 hours developing the survey, gathering contact information, and distributing surveys and enrollment forms to all engineering firms that are currently under contract or in contract negotiations with UDOT. • Each engineering firm will spend a few minutes to respond to the survey and to fill out the enrollment form. • A UDOT staff member will spend approximately 40 hours working with staff from the Comptroller's Office or a responsible party to ensure that direct deposit service is established for interested engineering firms.
Estimated cost	• Minimal.
Expected benefits	• Faster payment to engineering firms. By eliminating the effort and time required to produce and mail payment checks to vendors through the utilization of current technologies and services, engineering partners will realize faster payments and UDOT will realize a cost-effective and time-efficient payment process, as well as improved relationships with engineering firms.

2. Give Engineering Firms Access to ePM to Submit Invoices Electronically to UDOT

Exhibit V-3: Give Engineering Firms Access to ePM to Submit Invoices Electronically to UDOT

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• Assuming the submittal of electronic invoices through ePM does not require electronic signatures, the UDOT ePM team has estimated three months to implement this recommendation: – Approximately two months to modify ePM security to allow engineering partners access to submit invoices. – Approximately one month to develop the invoice forms and associated database modifications. – Approximately one week to develop any needed reports.
Estimated cost	• The UDOT ePM team has estimated approximately $42,000 to implement this recommendation: – Approximately $25,000 to modify ePM security to allow engineering partners access to submit invoices. – Approximately $11,000 to develop the invoice forms and associated database modifications. – Approximately $6,000 to develop any needed reports.
Expected benefits	• Efficient exchange and management of invoices. By having electronic invoices, UDOT and engineering firms can have real-time visibility to invoices and their status. Unlike paper invoices that are sent through the mail, electronic invoices are sent instantaneously so engineering firms are given instant confirmation that their invoices have been received. Electronic invoices also give the Comptroller's Office the age and status of invoices. UDOT project managers can view and respond to invoices from any location.

3. Track and Approve Invoices Through ePM

Exhibit V-4: Track and Approve Invoices Through ePM

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• Conservatively, Dye Management Group, Inc. estimates it would take approximately three months to develop a means to track and approve invoices: – Approximately two months to implement a means to allow managers online approval of invoices. The ePM team is not quite sure how to incorporate electronic signatures, yet they are confident it can be accomplished. Approval of an invoice does not necessarily need an electronic signature, but rather an action taken on the invoice screen, given the project manager has authority to perform an approval action. Various actions would also update the status of the invoice (e.g., received from vendor, in review, approved by UDOT project manager, processed by Comptroller's Office). All actions would have an associated audit trail. – Approximately one month to develop a means for engineering firms and UDOT to query invoice status. Engineering firms should only be allowed to query their own invoices and not those of other firms.
Estimated cost	• The Dye Management Group, Inc. team estimates approximately $36,000 to implement this recommendation: – Approximately $25,000 to develop a means to approve invoices and update status. – Approximately $11,000 to develop a means to present/query invoice status.
Expected benefits	• The Comptroller's Office and UDOT management can ensure invoices are processed in a timely fashion. • Engineering firms can track invoice status. This eliminates the need for firms to contact UDOT project managers with invoice status queries.

C. Virtual Teaming

1. Use the Internet to Facilitate Meetings

Exhibit V-5: Use the Internet to Facilitate Meetings

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to complete	• Approximately one month (elapsed time) to evaluate and choose an Internet meeting service provider. • Approximately two weeks for UDOT staff to customize instructions and to assist project mangers in the use of the service.
Estimated cost	• Approximately $3,600 for UDOT to customize instructions and assist project managers. • Example costs from Internet meeting service providers are as follows: – WebEx (http://www.Webex.com/) offers a free trial period and tailored solutions. Standard service packages include: • WebEx Express costs $375 per month. This includes five participants with unlimited usage and meetings ($10 per quarter hour for each additional seat). Toll call-in includes 200 minutes at no extra charge (additional minutes cost $0.05 per minute per participant). • WebEx Meeting Center Pro costs $995 per month. This includes five participants with unlimited usage and meetings ($10 per quarter hour for each additional seat). Toll call-in includes 500 minutes at no extra charge (additional minutes cost $0.20 per minute per participant). – Microsoft Live Meeting (www.microsoft.com) offers a free trial period. Standard services include: • Live Meeting Pay-Per-Use costs $0.35 per minute per participant. This includes an unlimited number of participants or meetings. • Live Meeting Personal Edition costs $14.99 per month or $99 per year. This includes up to five participants. Only one meeting organizer per subscription is allowed to schedule and conduct meetings.
Expected benefits	• Reduction in travel expenses and time. • By having the ability to hold ad hoc meetings, include remote resources, and collaborate on the same documents, project communications are greatly improved.

2. Expand the Use of Videoconferencing to All Regions and to Engineering Partners

Exhibit V-6: Expand the Use of Videoconferencing

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• UDOT is currently working to implement videoconferencing at all regions: – Approximately two days for UDOT staff to develop and communicate procedures for scheduling videoconferencing meetings. – It is assumed instructions are currently available on how to use videoconferencing equipment. This information must be made available at all videoconferencing sites.
Estimated cost	• Approximately $720 for two days at $45/hour for state staff to develop videoconferencing procedures.
Expected benefits	• Reduced travel expenses and travel time. • By having the ability to hold ad hoc meetings and include remote resources, project communications are greatly improved.

3. Share Calendars by Providing Engineering Firm Project Managers and Other Key Project Team Members with GroupWise E-mail Accounts

Exhibit V-7: Share Calendars

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• Implement as needed. Project managers can choose to provide engineering partners with GroupWise accounts or these accounts can be provided upon notice to proceed.
Estimated cost	• The additional costs to UDOT are unknown, as the number of additional users is unknown at this time. The costs are associated with the support of additional GroupWise users and the space required to store e-mail and calendars.
Expected benefits	• For the life of a project, UDOT project managers and all project team members have visibility to team member calendars. By eliminating the need and time to determine team member availability, UDOT project mangers can efficiently schedule meetings.

D. Project Document Sharing

1. Share Documents via Software

Exhibit V-8: Share Documents via Software

Estimates*	Implementation Plan
Priority	• Medium.
Estimated time to complete	• Approximately one month with two programmers to configure ProjectWise to allow for secure, simultaneous viewing of documents with engineering firms: – Approximately one month for one UDOT staff member to develop document sharing procedures. – Approximately two weeks for two UDOT staff members to prepare and conduct training for project team members to use ProjectWise document sharing capabilities.
Estimated cost	• UDOT currently owns ProjectWise software. UDOT may need to purchase more seats for the software. The total cost of resources is estimated at $54,400: – Approximately $40,000 for programmers ($125/hr). – Approximately $7,200 for UDOT staff ($45/hr) to develop procedures. – Approximately $7,200 for UDOT staff ($45/hr) to deliver training.
Expected benefits	• Simultaneous viewing of project documents. • Document version control, elimination of duplicates. • Common repository of project documents.

*These estimates are for a ProjectWise implementation and illustrate what implementation time and costs may be for a document-sharing system. If a different system is used, these estimates would need to be revised.

2. For Smaller Projects, Standardize Document Sharing Procedures

Exhibit V-9: Standardize Document Sharing Procedures

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to complete	• Approximately one month for one UDOT staff member to develop document sharing procedures. • Approximately two days for UDOT staff to prepare and survey engineering firms.
Estimated cost	• The total cost of resources is estimated at $7,920: – Approximately $7,200 for UDOT staff ($45/hr) to develop procedures.

Estimates	Implementation Plan
	– Approximately $720 for UDOT staff ($45/hr) to deliver training.
Expected benefits	• Simplify engineering firm experience with UDOT by standardizing document sharing procedures. • Document version control, elimination of duplicates. • Common repository of project documents.

E. Project Management Tools

1. Consider Using Simple Project Software to Manage Smaller Projects

Exhibit V-10: Consider Using Simple Project Software to Manage Smaller Projects

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• Approximately one month for UDOT staff to develop criteria to determine which projects can use MS Project and to develop alternative reporting procedures for program management. • Approximately two weeks for UDOT staff to prepare and deliver project management training.
Estimated cost	• It is assumed that UDOT has licenses for Microsoft Project. Approximately $10,800 to implement this recommendation: – Approximately $7,200 to develop criteria and reporting procedures. – Approximately $3,600 to develop MS Project training and deliver one class.
Expected benefits	• Reduces the ePM administrative burden on UDOT project managers.

*These estimates are based upon implementing Microsoft Project. Costs may vary if other software is used. These illustrate the types of costs that would be incurred.

2. Provide Project Management and ePM Training

Exhibit V-11: Provide Project Management and ePM Training

Estimates	Implementation Plan
Priority	• High.
Estimated time to complete	• It would take UDOT staff one month to develop a project management skills training curriculum. • It would take two UDOT ePM staff members one month to develop and deliver an ePM course.

Estimates	Implementation Plan
	• It would take UDOT staff one month to develop each additional training module.
Estimated cost	• This recommendation does not require additional technologies. Approximately $54,400 to implement this recommendation: – Approximately $7,200 to develop a project management training curriculum ($45/hr). – Approximately $40,000 to develop an ePM training and deliver one class ($125/hr). – Approximately $7,200 to develop each additional training module ($45/hr).
Expected benefits	• Improved project management skill set. • Integration of best practices for project management and tools. • Establishment of a continuous improvement environment.

3. Enhance ePM to Allow Engineering Firms Access to ePM to Submit and Maintain Project Schedules

Exhibit V-12: Enhance ePM to Allow Engineering Firms Access to ePM to Submit and Maintain Project Schedules

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to complete	• Approximately two months for an ePM programmer to modify ePM security to allow engineering partners access to submit and maintain project schedules. • Approximately one month to develop needed reports or related logic. • For training, refer to previous recommendation.
Estimated cost	• Approximately $60,000 to implement this recommendation: – Approximately $40,000 ($125/hr) to modify ePM security to allow engineering partners access to submit invoices. – Approximately $20,000 ($125/hr) to develop needed reports or related logic.
Expected benefits	• Reduces the administrative burden on UDOT project managers.

4. Develop a Means via ePM to Report Exceptions Between Project Schedule and Invoice

Exhibit V-13: Develop a Means via ePM to Report Exceptions Between Project Schedules and Invoice

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to complete	• Approximately two weeks for an ePM programmer to develop the exception report.
Estimated cost	• Approximately $10,000 ($125/hr) to modify ePM security to allow engineering partners access to submit invoices.
Expected benefits	• Reduces the administrative burden on UDOT project managers.

F. Other Recommendations

1. With Approval from Auditors, Continue to Develop Electronic Approval/Signature Capabilities and Procedures

Exhibit V-14: Continue to Develop Electronic Approval/Signature Capabilities

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to complete	• The ePM team is not quite sure how to incorporate electronic signatures, yet they are confident it can be accomplished.
Estimated cost	• To be determined once the method used to capture signatures is identified.
Expected benefits	• Speeds up signature processes by eliminating the need to walk forms around for signatures. • Offers the ability to track the status of signatures for a particular form.

2. Modify Contracts to Require Engineering Partners to Deliver As-Builts Upon Completion of Construction

Exhibit V-15: Modify Contracts to Require Engineering Partners to Deliver As-Builts

Estimates	Implementation Plan
Priority	• Medium.
Estimated time to	• One month (elapsed time):

Estimates	Implementation Plan
complete	– UDOT staff will need to spend approximately one day to determine the process by which delivery of as-builts is added to the scope of engineering firm contracts and to define the process used by engineering firms to deliver as-builts back to UDOT.
Estimated cost	• The cost to have engineering firms perform this task must be negotiated for each contract.
Expected benefits	• Consultants can use the same software to update original design documents. Therefore, it is expected that as-built drawings will be more accurate than redlined drawings completed by construction staff.

Appendix A

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Exhibit A-1: UDOT Opportunities by Interview Group

Category	Opportunity	Benefit	Explanation/Comments	Source
Design Document Exchange	Provide iPlot support training or allow alternative format.	Standardize drawing submittal. Reduce submittal times.	In October 2004, documentation on iPlot became available on UDOT's Web page. Consultants and local agencies have a hard time converting files using iPlot. It also represents an additional expense for them. UDOT uses iPlot to store the files generated for each project in a consistent format. An option would be for UDOT to do the conversion process instead of the consulting companies, as this does not seem to be a nationwide tool.	Partner IT Managers Interview 11/15/04
Design Document Exchange	Electronic file sharing (CAD files).	Reduce time and change orders.	Work simultaneously on design documents. When consultant does part of the project and UDOT the other, CAD files must be managed and changes communicated, so that everyone is working from the same plan.	Partner Project Manager Interview 11/16/04
Design Document Exchange	Make as-builts available to consultants.	Improved baseline information for design team.		Partner Project Manager Interview 11/16/04
Design Document Exchange	Consulting Services and/or project m anager should receive plans from consultants electronically.	Efficient exchange of critical project and contract documentation.		UDOT Comptroller Group Interview 11/9/04
Design Document Exchange	File sharing. Store in a single place.	Reduce duplicate reviews, improve accessibility to information, improve communications.	Allow people to work on the same files. Currently, tie files to a project to improve collaboration and include features such as geo-referencing. Currently piloting ProjectWise.	UDOT Construction Interview 11/15/04
Design Document Exchange	Standardize as-built drawings and convert to compatible version.	Provide a common start point for the design team.	As-built drawings are stored in electronic format but using an obsolete software.	UDOT Construction Interview 11/15/04
Design Document Exchange	Improve access to design files.	Qwest has access to needed information in a timely and usable format.	Qwest would like improved access to design files. Sometimes these files are e-mailed, other times they are sent via FTP. Qwest must also contact a variety of people within UDOT to get needed files. UDOT needs to send files in a specific format. There is a standard list of what Qwest needs for every project. These files could be delivered or available on an FTP site as a package. Utilities should not have to track down files.	UDOT Consulting Services Interview 11/9/04
Design Document Exchange	Get utilities involved in final design review.	Improved designs.	Overlay utility designs to see conflicts; work together to resolve, rather than making comments on design documents.	UDOT Consulting Services Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Design Document Exchange	Exchange design documents.	Reduced amount of rework, number of addendums, and change orders. Better organization, retention, and sharing of design documents.	Consultants need to port products (plans, review documents). Now, everything is done by paper or e-mail to PM. CAD files must be managed and changes communicated, so that everyone is working from the same plan. Would like to work simultaneously on design documents. Need version control.	UDOT Executive Interview 11/9/04
Design Document Exchange	Common work area.	Elimination of data duplication and synchronization/version control efforts. Version control and change tracking to see who changed what and when.	Currently, information is replicated on separate hardware for consultants. Upon completion, UDOT must get information back. Setup and transmission of the data is tedious. To do this, must resolve firewall issues. E-mail system cannot handle zip files, so transfers must be done using FTP sites or delivery of burned CDs. To get plans into the planning room, must burn CDs and massage data.	UDOT ISS Group Interview 11/9/04
Design Document Exchange	Improve project collaboration, sharing of design documents.	Improved access to project information.	Piloting ProjectWise software on three projects, only one of which projects uses Consultants. Information sharing issues, because central and regions are on different servers. Possibly consider all information for large projects (based on budget, project size, number of players) housed on the same server.	UDOT Structures Group Interview 11/9/04
Design Document Exchange	Improve design document sharing.	Improved quality of design.	For design documents (consultant may be designing roadway, UDOT may be designing bridge), consultant designers are never in-house, so we are always sharing information. Need to keep iterations straight. Need a common view of information, shared real time (during design phase). Need changes flagged. Need to notify team of changes.	UDOT Structures Group Interview 11/9/04
Design Document Exchange	Share CAD files.	Increase structures work with consultants.	CAD files need to be centralized in regions to the location that does the project. Region servers (no WAN) do file transfer. We have avoided doing design work on consultant design projects because of this difficulty. We have a heavy workload and pick projects on which we don't have to work with consultants, we pick internal projects. That is, we are making decisions to outsource based on the wrong reasons.	UDOT Structures Group Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Design Document Exchange	Improve data exchange with third parties (local governments, railroad, and utilities).	Improved communication with third parties.	With locals, exchange design, final drawings, CAD, local government sign-off; they archive their own drawings. Majority of local do not have resources, structures group, so they hire it out to a consulting firm.	UDOT Structures Group Interview 11/9/04
Design Document Exchange	Exchange as-built drawings back to design.	Improved baseline information for design team.	Weak on as-built drawings. Transfer from design out into the field. Used to pencil in changes on hard copy. Construction does not have access to CAD. Need a resource to monitor construction and create as-builts. When we need as-builts 10 years from now, all we have is the old plan which does not match the as-built. There should be a handoff of the as-builts back to design at end of construction.	UDOT Structures Group Interview-11/9/04
Project Document and Data Exchange	Use project sites for file sharing (e-rooms).	Improve collaboration.	I-15 was the first collaboration effort.	Partner IT Managers Interview 11/15/04
Project Document and Data Exchange	Electronic transmittal of schedules for construction.	Improve accuracy and reduce labor time.	Contractors are required to use SureTrak to develop construction schedules. Electronic submittal could also perform updates during the project.	Partner IT Managers Interview 11/15/04
Project Document and Data Exchange	Consulting Services and/or project manager should receive invoices, mods, and change orders from consultants electronically.	Efficient exchange of critical project and contract documentation.		UDOT Comptroller Group Interview 11/9/04
Project Document and Data Exchange	Electronic Certificate of Compliance.	Reduce response time, improve accuracy.	Currently, certificates of compliance are being submitted on paper.	UDOT Construction Interview 11/15/04
Project Document and Data Exchange	Knowledge management.	Access to needed and valuable information.	UDOT drives, Hummingbird, Region toolboxes, intraweb, interweb. We spend a lot of time updating changes.	UDOT Consulting Services Interview 11/9/04
Project Document and Data Exchange	Exchange project management information.	Improved project communications. Free project managers from burdensome administrative activities.	Consultants need to update project manager on project status. Now, everything is done by paper or e-mail to project manager.	UDOT Executive Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Project Document and Data Exchange	Common work area.	Elimination of data duplication and synchronization/version control efforts. Version control and change tracking to see who changed what and when.	Currently, information is replicated on separate hardware for consultants. Upon completion, UDOT must get the information back. Set-up and transmission of the data is tedious. To do this, must resolve firewall issues. Email system cannot handle zip files, so transfers must be done using FTP sites or delivery of burned CDs.	UDOT ISS Group Interview 11/9/04
Project Document and Data Exchange	Electronic documentation submittal.	Reduce data entry.	Paperwork redundancy. Project development drove the necessity to duplicate forms. Financial screening form, contract (form 1 and 2 attachment screen 505. Print a screen and attach it to a PDF form, by the time you are done with from 2 many duplicates. The information is all in the system and it is being reported again.)	UDOT Project Managers Interview 11/16/04
Project Document and Data Exchange	Need for knowledge management	Simplified access to key information.	Many documents exist on e-mail servers, which are lost when the server deletes old mail. Using Hummingbird document management system at UDOT. The Hummingbird file structure is *huge*. Everything goes in it. For large projects, need a special folder. On legacy projects, talked about what goes into Hummingbird and what does not. We were more focused on how to use software and not on content. There is a huge cost to maintain, hardware, software, and *filtering* through all of this stuff. For less important stuff, do an auto-delete after a few years.	UDOT Structures Group Interview 11/9/04
Project Document and Data Exchange	Improve project collaboration, sharing of design documents.	Improved access to project information.	Piloting ProjectWise software on three projects, only one of these projects uses consultants. Information-sharing issues, because central and regions are on different servers. Possibly consider all information for large projects (based on budget, project size, number of players) housed on the same server.	UDOT Structures Group Interview 11/9/04
Invoice and Payment Process	Electronic invoicing.	Faster payment. Track payment status by consultants.	Currently, invoices are hand delivered, and if local government is involved, its signature has to be collected which delays payments.	Partner IT Managers Interview - 11/15/04
Invoice and Payment Process	Electronic invoicing.	Reduce payment time.		Partner Office Manager Interview - 11/16/04
Invoice and Payment Process	Electronic invoicing.	Reduce payment time and calls.	There are no consistent requirements for invoicing. Some PMs require more detailed information than others.	Partner Project Manager Interview - 11/16/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Invoice and Payment Process	State electronic payment (direct deposit) for consultants.	Efficient payment process. Improved consultant relations. Ability for consultants to track activities, such as invoice and payment status. Reduction in call-handling activities to track payment status for consultants.	Current initiative. Roll out to consultants.	UDOT Comptroller Group Interview 11/9/04
Invoice and Payment Process	Consultants submit invoices electronically. Automatic attachment/match of payment voucher.	Efficient invoice process. Ability for consultants to track activities, such as invoice and payment status. Reduction in call-handling activities to track payment status for consultants.	Consultants have varying systems. UDOT would need to work with consultants to develop a means to electronically interface invoice information.	UDOT Comptroller Group Interview 11/9/04
Invoice and Payment Process	Electronic payment system to ensure subcontractors get paid (DBE).	Efficient payment process. Reduction in call-handling activities to track payment status for consultants.		UDOT Construction Interview 11/15/04
Invoice and Payment Process	Improve construction payment system.	Track payments to specific project.		UDOT Construction Interview 11/15/04
Invoice and Payment Process	Electronic invoicing.	Reduce payment time and calls.		UDOT Project Managers Interview 11/16/04
Invoice and Payment Process	Track invoices.	Replace consultant inquiry response effort with consultant self-service capabilities.	Consultants cannot track an invoice or payment. It may be sitting on a project manager's desk waiting approval.	UDOT Structures Group Interview 11/9/04
Virtual Teaming	Video conferencing, videox.	Reduce travel time and expenses.		Partner IT Managers Interview 11/15/04
Virtual Teaming	Improve meeting scheduling system.	Improve communication.	Most private companies use Microsoft products.	Partner Marketing Interview 11/15/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Virtual Teaming	Videoconferencing capability, integration.	Improve communication. Reduce travel costs and time.	It is currently not used. Could let consultants use the central office videoconferencing equipment, so that they can get in on the meeting without having to set up videoconferencing at their firms. This could include local governments.	Partner Project Manager Interview 11/16/04
Virtual Teaming	Net meetings.	Reduce PM travel time. Improve response to project issues. Simplify and improve collaboration.	This could include PC videoconferencing, Web collaboration (net meetings).	UDOT Executive Interview 11/9/04
Virtual Teaming	Electronic scheduling system.	Improve communications.	Consultants do not have access to GroupWise.	UDOT Project Managers Interview 11/16/04
Virtual Teaming	Videoconferencing.	Reduce travel cost improve communications.	Regions have a problem with videoconferencing (Region 2 does not have one).	UDOT Project Managers Interview 11/16/04
Virtual Teaming	Simplify method to book consultants for meetings, determine consultant availability for meetings.	Reduced time scheduling and organizing meetings.	Consultants do not use GroupWise. More likely, they use MS Outlook. Would like an automated way to see consultant staff availability for meetings and then book them for a meeting.	UDOT Structures Group Interview 11/9/04
Virtual Teaming	Get utilities involved in final design review.	Improved designs.	Overlay utility designs to see conflicts; work together to resolve rather than making comments on design documents.	UDOT Consulting Services Interview 11/9/04
Bid and Contract Document Exchange	Increase length of proposals for large projects.	Improve clarity of proposals.	Proposals are limited to six pages, which reduces a firm's ability to explain the different disciplines involved.	Partner Marketing Interview 11/15/04
Bid and Contract Document Exchange	Clarify bid package requirements.	Reduce redundant information.	There is some confusion on what documents are needed (for example, Appendix B team members certifications).	Partner Marketing Interview 11/15/04
Bid and Contract Document Exchange	RFP pipeline announcements.	Increase competition. Allow companies to prioritize work. Reduce number of calls.	There is no intermediate information between STIP and advertisement.	Partner Marketing Interview 11/15/04
Bid and Contract Document Exchange	Electronic proposal submittal for small projects.	Simplify bidding process.	With electronic submittal for large projects, there is a concern that the quality of the proposal may be compromised	Partner Marketing Interview 11/15/04
Bid and Contract Document Exchange	Electronic contracting.	Reduce project completion time.	Depending on the project and project manager, it can take up to three months between the time a project is awarded and an order to proceed is issued.	Partner Office Manager Interview 11/16/04
Bid and Contract Document Exchange	Consulting Services and/or project manager should receive bids and bid specs from consultants electronically.	Efficient exchange of critical project and contract documentation.		UDOT Comptroller Group Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Bid and Contract Document Exchange	Electronic communication of contracts and attachments from consultant into document management system. This would eliminate the need to scan the documents into the system.	Elimination of document delivery and scanning tasks.	Since moving to Oracle, it has been difficult to get Word documents into the document management system.	UDOT Comptroller Group Interview 11/9/04
Bid and Contract Document Exchange	Provide consistent guidelines for alternative project procurement methods (DB, GC/CM).	Prevent incorrect data submittal, reduce process time, improve accuracy of information.	Contractors are given different information on how to put together bid packages and how to manage data once the project is awarded.	UDOT Construction Interview 11/15/04
Bid and Contract Document Exchange	Contracting documents.		Electronic exchange of contract documents.	UDOT Executive Interview 11/9/04
Bid and Contract Document Exchange	Understand consultant resource availability.	Improved workforce planning.	Can't know how booked consultants are for all their clients, but should know whether staffing conflicts exist for UDOT projects.	UDOT Structures Group Interview 11/9/04
UDOT Web	Create a UDOT contact list.	Improve communication.	There seems to be some confusion regarding who is responsible for what.	Partner Marketing Interview 11/15/04
UDOT Web	Improve UDOT Web page.	Inquiry reduction. Better communication.		Partner Marketing Interview 11/15/04
UDOT Web	Improve UDOT Web page by making it easier to navigate.	Better communication.	The previous version of the Web page was perceived as easier to navigate and find information.	Partner Project Manager Interview 11/16/04
UDOT Web	Make all design and construction manuals and forms available on the UDOT Web page.	Improve communications and inquires.	Not all manuals and forms are electronically available or in the same place. This makes it hard for consultants to find the forms. Explanations for each form are also recommended.	Partner Project Manager Interview 11/16/04
UDOT Web	Improve access to UDOT information.	Self-service access to needed UDOT information by local governments.	Local governments such as West Valley City put packages together for UDOT advertisement. Need to find person at UDOT who can tell where to get needed information. Lots of information is posted on the Web, but it is impossible to find without UDOT help.	UDOT Consulting Services Interview 11/9/04
UDOT Web	Improved access to UDOT Web information.	Simple access to needed information for utilities and local governments.	Web paths are long and complicated, and finding information can be difficult	UDOT Consulting Services Interview 11/9/04
UDOT Web	Use link reference instead of sending attachments (use interweb).	Reduce storage space cost.		UDOT Project Managers Interview 11/16/04
ePM	Allow consultants to access to ePM to define schedules.	Improve communications.		Partner Marketing Interview 11/15/04
ePM	Increase access to ePM.	Track and report schedules. Reduce PM time entering data.		Partner Office Manager Interview 11/16/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont).

Category	Opportunity	Benefit	Explanation / Comments	Source
ePM	Standardize work breakdown requirements.	More accurate cost and schedule estimates and tracking.	For example, there are several tasks for right of way and utilities but only one for environmental studies.	Partner Office Manager Interview 11/16/04
ePM	Standardize scheduling format submittal.	Reduce time re-entering schedules.		Partner Office Manager Interview 11/16/04
ePM	Have consultants electronically transmit schedule.	Improved cash management.	An input screen has been requested from ISS that will allow consultants to enter information on a new ePM screen.	UDOT Comptroller Group Interview 11/90/04
ePM	Establish and use a common project number across ePM and accounting systems.	Improved ability to find project information.	Make decision on project number. The project number is set up in a certain way, so that information can be passed from ePM to the accounting system. FHWA has a project number. Then when authorized, a sub project and phase number(s) are assigned. Project team (ePM?)refers to project by old time charge number. Comptroller team must do a translation to find project related information. The department and the consultant must be consistent.	UDOT Comptroller Group Interview 11/9/04
ePM	ePM forms - online, electronic submittal.	Elimination of processes to keep forms updated in numerous locations within UDOT.		UDOT Consulting Services Interview 11/9/04
ePM	Improve information on upcoming projects.	External partners such as Utah Power and Light, Qwest can plan for resources.	ePM Web query in development will help with planning and project estimation.	UDOT Consulting Services Interview 11/9/04
ePM	Get local government projects on to ePM and provide local governments and utilities access to ePM.	Visibility to local projects.	Project manager may not pay much attention to less critical local projects; local government projects may not be on ePM. Limitation: Project managers in regions have 20 to 30 projects each. They can't effectively manage this many. Local government projects are usually lower priority projects for the project managers. Proposed: outsource the project manager function for local government projects.Then redefine role of region PM to become the UDOT liason. Their only job would be federal oversight. The consultant PM would need full access to ePM. Security in ePM allows PMs to update any project.	UDOT Consulting Services Interview 11/9/04
ePM	Automatically compare reported hours against plan.	Free project managers from burdensome administrative activities.	Invoicing is very time consuming for project managers, as consultants report hours on each invoice. The PM needs to check and approve the hours and invoice. It would be nice to use the ePM system to compare reported hours against the plan and only kick out exceptions for the PM to review.	UDOT Executive Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
ePM	Expand consultant access to ePM.	Reduce project manager hours maintaining ePM project data.	Allow consultants ability to enter estimate into ePM. Currently, project manager enters independent estimate into ePM. Then after negotiations, consultant has limited access to ePM to enter engineer's estimate of project using agreed to hours.	UDOT Executive Interview 11/9/04
ePM	Project manager overseeing consultants must do all ePM data entry.		Ask project managers how much of their time is spent entering information and reconciling information on ePM. Also, find out if they believe information on the ePM is accurate/helpful.	UDOT Executive Interview 11/9/04
ePM	Automate consultant schedule entry into ePM.	More accurate project dashboard, published schedule. Credible project schedule information.	Allow consultants to enter schedule on ePM. Schedule comes in with negotiated agreement and then with invoices.	UDOT Executive Interview 11/9/04
ePM	Give consultant project managers access to ePM.	Relieve UDOT project managers of some administrative data entry tasks.	ePM schedule updates from Consultants must be manually entered by the UDOT project manager.	UDOT ISS Group Interview 11/9/04
ePM	ePM training.	Effective project management.	There is no ongoing training.	UDOT Project Managers Interview 11/16/04
ePM	ePM level of detail for consultants should be the same as for internal projects.	Greater understanding of consultant status.		UDOT Structures Group Interview 11/9/04
ePM	Increase access to ePM and provide training to consultants.	Track and report schedules. Reduce ePM time entering data.	One challenge is feeding the system adequate information. There is not enough feedback from project manager to know what ePM is telling them. Access to ePM is limited. There is no training on how to interact with ePM. This delays projects as there is no agreement on the critical path.	Partner Project Manager Interview 11/16/04
ePM	Fix ePM response and accuracy issues.	ePM becomes a more valuable tool for UDOT project management.	ePM does not schedule well. It does track hours, payroll well. ePM is not that accurate, because it is based on a design process that is no longer used (faulty algorithm).	UDOT ISS Group Interview 11/9/04
Electronic Approval/ Signatures Work Flow	Electronic permit approval and plan review with local governments.	Efficient approval process.		Partner Office Manager Interview 11/16/04
Electronic Approval/ Signatures Work Flow	Electronic change order authorization.	Improve project flow.	Change orders require authorization from project manager and sometimes delay the project.	Partner Project Manager Interview 11/16/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Electronic Approval/ Signatures Work Flow	Give project managers electronic approval/signature capabilities.	Efficient approval process. Improved consultant relations. Ability for consultants to track activities, such as invoice and payment status. Reduction in call-handling activities to track payment status for consultants	Invoices must be approved by project manager and possibly local governments.	UDOT Comptroller Group Interview 11/9/04
Electronic Approval/ Signatures Work Flow	Electronic alerts to project manager to close contracts.	Efficient contract closure process.	Need a better process to close contracts. This would include electronic signatures and work flow to notify supervisors if certain actions have not taken place. The new financial system has work flow for purchasing staff. Issue with final payment and release of escrow: Comptroller team sends e-mails to project managers to close out. If they do not respond, call company to close out.	UDOT Comptroller Group Interview 11/9/04
ePM	ePM: Train project managers, improve software or replace it.	Allow for real cost tracking.	ePM red flags tasks that go over budget. Data are fudged to fit system.	Partner Project Manager Interview 11/16/04
Form Submittal	ePM forms - online, electronic submittal.	Elimination of processes to keep forms updated in numerous locations within UDOT.		UDOT Consulting Services Interview 11/9/04
Form Submittal	Electronic submittal by consultants of contract documents (responses to RFQ, RFP, and other negotiation documents).	Reduced data entry. Efficient form submittal and retention process.	Consultants that do repeat business with UDOT must fill out forms such as company background. UDOT must have this information on file. Consultants should only need to provide updates. Need Web-based form entry and submittal.	UDOT Executive Interview 11/9/04
Form Submittal	Electronic consultant evaluation.		There was one initiative to go electronically that failed. Now it is being done on paper.	UDOT Project Managers Interview 11/16/04
Network/Security	Improve FTP access.	Improve communication.	DOT FTP site: it is hard to go through the security. Uploading does not always work.	Partner Project Manager Interview 11/16/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Network/Security	Improve network speed/access	Improved system and Web response. Reduction in staff downtime.	Need to improve connection speed/access from region to region. Starting to look at Citrix.	UDOT Executive Interview 11/9/04
Network/Security	Common work area.	Elimination of data duplication and synchronization/version control efforts. Version control and change tracking to see who changed what and when.	Currently, information is replicated on separate hardware for consultants. Upon completion, must get information back. Set-up and transmission is tedious. To do this, must resolve firewall issues. E-mail system can not handle zip files, so transfers must be done using FTP sites or delivery of burned CDs.	UDOT ISS Group Interview 11/9/04
Network/Security	Fix ePM response and accuracy issues.	ePM becomes a more valuable tool for UDOT project management.	ePM had poor performance in remote regions.	UDOT ISS Group Interview 11/9/04
Network/Security	Common port to access needed applications.	Single point of entry for users.	Users currently use a variety of techniques and user IDs to access UDOT applications and data repositories.	UDOT ISS Group Interview 11/9/04
Network/Security	Firewall and security improvements.	Allow external and remote users access to UDOT systems and data.		UDOT ISS Group Interview 11/9/04
Network/Security	Assign software to the best suited users.	Improve efficiency.	Document management for project. Hummingbird is being used by process people not project.	UDOT Project Managers Interview 11/16/04
Network/Security	Access to FTP.	Improve communications.	Consultant can't get to the server. Usually upload to FTP site. Mainly for CAD files.	UDOT Project Managers Interview 11/16/04
Other	UDOT acquire blue book rental rates.			Partner Office Manager Interview 11/16/04
Other	Implement electronic change order submittal.		Current process requires re-entry of contractor's payroll.	UDOT Construction Interview 11/15/04
Other	Implement MMS.	Track and report costs and schedules.	UDOT is in the process of developing the system. This system could be linked to the electronic payment system.	UDOT Construction Interview 11/15/04
Other	Determine project priorities.			UDOT Project Managers Interview 11/16/04
Other	Standardize software.		Talk to neighboring states (DOTs) to see if they are willing to take a step together in implementing common technologies.	UDOT Project Managers Interview 11/16/04
Performance	Establish a maximum response time for project managers.	Provide UDOT visibility and reduce delays and calls.	Project managers do not have a maximum time to respond to change orders or invoices.	Partner Project Manager Interview 11/16/04
Performance	Evaluation forms.		Need to identify systemic problems rather than project project problems with consultants.	UDOT Executive Interview 11/9/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Process/ Methodology/QA	Standardize proposal review criteria.	Improve proposal quality.	Some review comments do not seem to refer to the project. Clear feedback can improve proposal quality.	Partner Marketing Interview 11/15/04
Process/ Methodology/QA	Standardize region's requirements (CAD standards).	Reduce review time.	Projects that involve more than one region.	Partner Project Manager Interview 11/16/04
Process/ Methodology/QA	Focus groups between project manager and consultants.	Further identify opportunity areas.	Team effort to improve collaboration. It was found that project managers and consultants have the same concerns.	Partner Project Manager Interview 11/16/04
Process/ Methodology/QA	Develop a project team.	Improve communications.	DOT does not embrace consultant as part of the team. DOT could make information available. The level of trust is low.	Partner Project Manager Interview 11/16/04
Process/ Methodology/QA	Electronic database of lessons learned.	Improve efficiency.	Lessons learned database: Need access to lessons learned database for consultants. They should be able to input information when they are doing construction management. They need a vehicle to add information. This database is in ePM. Consultants need access to ePM.	UDOT Construction Interview 11/15/04
Process/ Methodology/QA	Standardize as-built drawings and convert to compatible version.	Provide a common start point for the design team.	As-built drawings are stored in electronic format but using obsolete software.	UDOT Construction Interview 11/15/04
Process/ Methodology/QA	Exchange as-built drawings back to design.	Improved baseline information for design team.	Weak on as-built drawings. Transfer from design out into the field. Used to pencil in changes to hard copy. Construction does not have access to CAD. Need a resource to monitor construction and create as-builts. When we need as-builts 10 years from now, all we have is old plan that does not match as-built. Should be a handoff sent back to design from construction at end of construction.	UDOT Structures Group Interview 11/9/04
Project Budget	Include local agencies in the scope and budget development.	Reduce change orders and delays.	Private firms negotiate with UDOT budget and schedule (e.g., traffic control) without consulting local agencies who are ultimately responsible for approval.	Partner Office Manager Interview 11/16/04
Project Budget	Improve project cost and budget estimation process using historical data.	Reduce change orders and delays.	Project cost and schedule changes significantly from STIP to letting.	Partner Office Manager Interview 11/16/04
Training	Increase access to ePM and provide training to consultants.	Track and report schedules. Reduce ePM time entering data.	One challenge is feeding the system adequate information. There is not enough feedback from project manager to know what ePM is telling them. Access to ePM is limited. There is no training on how to interact with ePM. This delays projects as there is no agreement on the critical path.	Partner Project Manager Interview 11/16/04
Training	Consistent project manager training.	Efficient use of software and procedures.	High turnover rates preclude project managers from becoming familiar with procedures and software use, to manager projects. This results in an inconsistent practice.	Partner Project Manager Interview 11/16/04
Training	ePM training.	Effective project management.	Not trained to use ePM. It is used to set up the project and make updates, but it is tweaked to get the results they want not the original schedule. Just to meet the reporting requirement.	Partner Project Manager Interview 11/16/04
Training	ePM: Train project managers, improve software or replace it.	Allow for real cost tracking.	ePM red flags tasks that go over budget. Data are fudged to fit system.	Partner Project Manager Interview 11/16/04

Exhibit A-1: UDOT Opportunities by Interview Group (cont.)

Category	Opportunity	Benefit	Explanation / Comments	Source
Training	Team building with consultants.		Consultants are not being seen as part of the team.	UDOT Project Managers Interview 11/16/04
Training	ePM training.	Effective project management.	There is no ongoing training.	UDOT Project Managers Interview 11/16/04

Exhibit A-2: List of Attendees

Meeting	Date	Attendees	Organization	Phone	E-mail Address
UDOT Comptroller	9-Nov-04	Charles Larsen	UDOT - Comptroller	(801) 965-4358	charleslarsen@utah.gov
UDOT Comptroller	9-Nov-04	Janet Steadman	UDOT - Comptroller	(801) 965-4004	jsteadman@utah.gov
UDOT Comptroller	9-Nov-04	Marci Soper	UDOT - Comptroller	(801) 965-4011	msoper@utah.gov
UDOT Comptroller	9-Nov-04	Cherise Young	UDOT - Comptroller	(801) 965-4801	cheriseyoung@utah.gov
UDOT Comptroller	9-Nov-04	Barbara Adams	UDOT - Comptroller	(801) 965-4034	bladams@utah.gov
UDOT Consulting Services	9-Nov-04	Marie Walton	UDOT - CS	965-4427	mariewalton@utah.gov
UDOT Consulting Services	9-Nov-04	Bruce Jensen	Utah Power	(801) 220-4419	bruce.jensen@pacificorp.com
UDOT Consulting Services	9-Nov-04	Don Christensen	Utah Power	(801) 220-2218	drchristensen@pacificorp.com
UDOT Consulting Services	9-Nov-04	Jeff Stapley	Qwest	(801) 974-8505	jeff.stapley@qwest.com
UDOT Consulting Services	9-Nov-04	Cheryl Bolinder	Qwest	(801) 974-8152	cheryl.bolinder@qwest.com
UDOT Consulting Services	9-Nov-04	Tyler Bell	Qwest	(801) 974-8162	tyler.bell@qwest.com
UDOT Consulting Services	9-Nov-04	Brett Hadley	UDOT	(801) 965-4366	bhadley@utah.gov
UDOT Consulting Services	9-Nov-04	Gaye Hettrick	UDOT - CS	965-4639	ghettrick@utah.gov
UDOT Consulting Services	9-Nov-04	Frank Long	FHWA	(801) 963-0078 x224	frank.long@fhwa.dot.gov
UDOT Consulting Services	9-Nov-04	Michael Seely	UDOT - Utilities/ Railroads	(801) 965-4176	mseely@utah.gov
UDOT Consulting Services	9-Nov-04	Darryl Johnson	West Valley City	963-3445	djohnson@ci.west-valley.ut.us

Meeting	Date	Attendees	Organization	Phone	E-mail Address
UDOT Executive	9-Nov-04	Jim McMinimee	UDOT - Project Development	(801) 965-4022	jmcminimee@utah.gov
UDOT Executive	9-Nov-04	Tracy Conti	UDOT - Region 3	(801) 227-8001	tconti@utah.gov
UDOT ISS	9-Nov-04	Michelle Verucchi	Software Manager	965-4490	mverucchi@utah.gov
UDOT ISS	9-Nov-04	Greg Herrington	IT Manager	965-4865	gherrington@utah.gov
UDOT ISS	9-Nov-04	Jesse Sweeten	Electronic Plan Room	965-3846	jsweeten@utah.gov
UDOT ISS	9-Nov-04	Shane Marshall	Design - Region 3	227-8044	smarshall@utah.gov
UDOT ISS	9-Nov-04	Steve Wilkins	ISS Project Lead	957-8572	stevewilkins@utah.gov
UDOT ISS	9-Nov-04	Darren Bunker	Civil Engineer III	965-4662	dbunker@utah.gov
UDOT ISS	9-Nov-04	Randall Stohel	IT Analyst	965-4908	randystohel@utah.gov
UDOT Structures	9-Nov-04	Todd Jensen	Bridge Engineer	957-8506	toddjensen@utah.gov
UDOT Structures	9-Nov-04	Keith Brown	GeoTech Engineer	965-4234	kebrown@utah.gov
UDOT Structures	9-Nov-04	Michael Fazio	Hydraulics Engineer	957-8556	mfazio@utah.gov
UDOT Structures	9-Nov-04	Boyde Wheeler	Deputy Bridge Engineer	964-4456	bwheeler@utah.gov
UDOT Structures	9-Nov-04	Dave Eixerberger	Bridge Operations	965-4191	deixenberger@utah.gov
Partner IT Management	15-Nov-04	Chad Ellis	Jacobs		chad.ellis@jacobs.com
Partner IT Management	15-Nov-04	Doug Graham	Horrocks Engineers		dougg@horrocks.com
Partner IT Management	15-Nov-04	Michael Gordon	HDR Engineering	281-8892	
Partner IT Management	15-Nov-04	Shawn Liddell	Sunrise Engineers		sliddell@sunrise-eng.com
Partner IT Management	15-Nov-04	Robb Stott	URS		robb_stott@urscorp.com
Partner IT	15-Nov-04	Ryan Hoolby	Carter & Burgess	355-1112	hoolbyrk@c.b.com

Meeting	Date	Attendees	Organization	Phone	E-mail Address
Management					
Partner Marketing	15-Nov-04	Parri Christie	URS	(801) 904-4039	parri-christie@urscorp.com
Partner Marketing	15-Nov-04	Larry Reasch	Horrocks Engineers	(801) 763-5100	larry@horrocks.com
Partner Marketing	15-Nov-04	Catherine Curtis	H.W. Lochner	262-8700	ccurtis@hwlochner.com
Partner Marketing	15-Nov-04	Dana Howcroft	Sunrise Engineers	523-0100	dhowcroft@sunrise-eng.com
Partner Marketing	15-Nov-04	Kellie Goddard	Stanley Consultants	293-8880	goddardkellie@stanleygroup.com
Partnet Accounting	15-Nov-04	Valerie Molle	Washington Group	268-9805	valerie.molle@wgint.com
Partnet Accounting	15-Nov-04	Maury Ballif	URS	904-4000	maury-ballif@urscorp.com
Partnet Accounting	15-Nov-04	Marc Arnoldsen	Horrocks Engineers	(801) 763-5132	marc@horrocks.com
Partnet Accounting	15-Nov-04	Mardi Pearson	Fehr & Peers	(801) 261-4700	mpearson@fehrandpeers.com
Partnet Accounting	15-Nov-04	Barbara Bunting	H.W. Lochner	262-8700	bbunting@hwlochner.com
Partnet Accounting	15-Nov-04	Brian McPhail	Sunrise Engineers	(435) 743-1116	bmcphail@sunrise-eng.com
UDOT Construction	15-Nov-04	Wendell Gardner	Bentley Systems		wendell.gardner@bentley.com
UDOT Construction	15-Nov-04	Greg Herrington	UDOT		gherrington@utah.gov
UDOT Construction	15-Nov-04	Darren Bunker	UDOT		dbunker@utah.gov
UDOT Construction	15-Nov-04	Darrell Giannoriati	UDOT		dgiannoriati@utah.gov
UDOT Construction	15-Nov-04	Tom Leholm	UDOT		tleholm@utah.gov
UDOT Construction	15-Nov-04	Denise Graham	UDOT		dgraham@utah.gov
UDOT Construction	15-Nov-04	Jesse Sweeten	UDOT		jsweeten@utah.gov
Partner Office Management	16-Nov-04	Matt Rifflan	InterPlan Co.	(801) 307-3400	matt@interplanio.com
Partner Office Management	16-Nov-04	Jim Horrocks	Horrocks Engineers	763-5100	jim@horrocks.com
Partner Office Management	16-Nov-04	Doug Atkin	Sunrise Engineers	(801) 523-0100	datkin@sunrise-eng.com
Partner Office Management	16-Nov-04	Tyler Robirds	H.W. Lochner	(801) 262-8700	trobirds@hwlochner.com

Meeting	Date	Attendees	Organization	Phone	E-mail Address
Partner Office Management	16-Nov-04	Renee Zollinger	Kleinfelder	(801) 261-3336	rzollinger@kleinfelder.com
Partner Office Management	16-Nov-04	Chuck Larson	J-U-B Engineers	(801) 886-9052	cal@jub.com
Partner Project Management	16-Nov-04	Andy Powell	URS	904-4000	andy_powell@urscorp.com
Partner Project Management	16-Nov-04	Curt Christensen	Kleinfelder	261-3336	cchristensen@kleinfelder.com
Partner Project Management	16-Nov-04	Russell Youd	Horrocks Engineers	763-5100	russell@horrocks.com
Partner Project Management	16-Nov-04	Mark Freeman	Stanley Consultants	293-8880	freemanmark@stanleygroup.com
Partner Project Management	16-Nov-04	Wes Starkenburg	Carter & Burgess	355-1112	starkenburgwj@c-b.com
UDOT Project Management	16-Nov-04	Terry Newell	UDOT - Region 2	975-4807	tnewell@utah.gov
UDOT Project Management	16-Nov-04	Angelo Papastamos	UDOT - PD	965-4561	apapastamos@utah.gov
UDOT Project Management	16-Nov-04	Brent Schvaneveldt	UDOT - Region 3	227-8012	bschvaneveldt@utah.gov
UDOT Project Management	16-Nov-04	Ed Rock	UDOT - Region 2	975-4856	erock@utah.gov

Appendix B

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Exhibit B-1: List of Survey Respondents

Organization	Name	Position	Telephone Number	E-mail Address
CDOT	Frank Kerstetter		(303) 757-9482	frank.kerstetter@dot.state.co.us
NCDOT	Mark Tyler		(919) 871-6800 x241	mtyler@dot.state.nc.us
Port of Seattle	Pamela Tupper	CDMS supervisor	(206) 988-5693	tupper.p@portseattle.org
NYDOT	Mike Arthur	IT coordinator	(518) 457-4098	marthur@dot.state.ny.us
PDOT	Dave Azzato		(717) 787-5914	dazzato@state.pa.us
TxDOT	Mark Marek	Director, Design Division	(512) 416-2601	mmarek@dot.state.tx.us
ODOT	Ronald Winterrowd		(503) 986-3206	
WSDOT	Jamie Selby		(360) 705-7039	
GDOT	Doug Chambers			
Carter & Burgess	Ryan Hoolby	IT manager	(801) 355-1112	hooleyrk@c.b.com
URS	Andy Powell		(801) 904-4000	
Louisiana	Dominic Cali	IT manager		
Maine	Dennis			

Interview Guide Results

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Electronic Invoicing and Payment

1. What tools are used to expedite the electronic invoicing and payment process for consultant progress payments?

CDOT	Currently, consultants submit invoices to project managers using hard copies. Internal invoices and payments are tracked using a custom application. CDOT has purchased an Enterprise Resource Planning (ERP) application. ERP is being implemented. Some of the modules will come online in July. This initiative will be fully implemented in July 2006. The estimated cost is $3 million including software and implementation. There are no plans to implement an electronic invoicing system.
NCDOT	Does not have an electronic invoice system for consultants or general contractors. Internally routes hard copy to project manager then accounting. Slow process.
PDOT	The Engineering and Construction Management System (ECMS) provides Web-based applications with near real-time processing in support of consultant selection, consultant agreement generation, and consultant invoicing. Project schedules are created by consultants at the beginning of the project and later tracked against progress. All vendors, including consulting firms, are required to register with ECMS. Once registered, firms are given a user name and password to access ECMS via the Internet. Using this secure access allows consultants to submit invoices through ECMS. It is a Web application and the only requirement is Internet Explorer 6.0. The project manager receives the invoice, approves it, and sends it for payment. There are five to six classifications within the system. The state works with SAP. There are check cuts and electronic transfers. It is possible to track invoices.
NYDOT	NYDOT does not have any standard electronic invoicing and payment process. The Consultant Management Bureau has been testing an NYDOT-developed electronic invoicing application—an MS Excel program named RoboBill—with a few consultant firms. The RoboBill program assists the consultant manager in reviewing the invoice.

Florida	The Consultant Invoice Transmittal System (CITS) is an application developed to reduce the dependency on manually processed paper documents, particularly professional services contracts, invoices, and supporting information. The system allows for the electronic generation and submittal of invoices by consultants over the Internet. There are two sections on the Web page: Invoices and Contracts. The Contracts section has one hyperlink: List My Contracts. This hyperlink gives access to the details of each of their contracts and/or invoices. The Invoices section may have three hyperlinks: Invoices to Review, Invoices in Progress, and Rejected Invoices. The Invoices to Review hyperlink gives the prime consultant the ability to review a subconsultant's invoice. The Invoices in Progress hyperlink allows the consultant to access invoices that have not been submitted to FDOT. The Rejected Invoices hyperlink provides the consultant access to the rejected invoice in order to correct and resubmit the invoice. Each hyperlink option in the Invoices section appears on the Consultant Home page when there is one or more invoice in the queue.
Louisiana	Internally, project managers submit approved invoices to the administration department in electronic format using an in-house developed software EITS. Once the invoices are received, a check is cut the same day if it was received before 3:00 pm (otherwise the following day). The administration department does not get any of the documentation submitted by the private firms but the massaged data from the project mangers. Diane Chestain knows about the software.
Maine	Does not have an electronic invoice system. Does have an electronic system to track payments internally: Free 2000 (developed in-house). It has been extended to track invoice payments. The code is entered and the invoice is reviewed on screen. Free 2000 is used to enter payroll and travel expense requests. It had a Web-based interface and tied with some pre-existing financial systems. Only track internally. Do no do electronic invoicing from private firms.
URS	Not using any electronic invoicing. Once in a while, someone will send an invoice through e-mail but everything is still processed on paper.
Carter and Burgess	The Utah office is not currently using electronic invoicing with design clients. All invoices are submitted using hard copies.
Louis Berger Gruop	The Louis Berger Group does not invoice electronically. However, the company does have a Web-enabled electronic timesheet system, Unanet, which is used to collect, manage, and report time based on a project's alphanumeric code. Berger generally prepares invoices on a monthly basis unless specified otherwise in the contract or agreement with the client.

2. To what extent is the electronic invoicing and payment system used by consultants or other external staff?

CDOT	CDOT's system does not allow consultants or external staff access to the ERP system.
NCDOT	Does not have an electronic invoicing system.
PDOT	All consultants, including subs, are required to submit invoices through the ECMRESs. It does not cost anything to use the system.
NYDOT	The RoboBill program currently provides a means for checking the consultant's invoice. After the invoice has been approved, a paper copy goes to Contract Payments, where they re-enter key payment data to send the invoice electronically to the Office of the State Comptroller for payment.
Florida	To a large extent, CITS is used.
Maine	Does not use electronic invoicing.
URS	Does not use electronic invoicing.
Carter and Burgess	Does not use electronic invoicing.
Louis Berger Group	Does not use electronic invoicing.

3. What capabilities do these systems and tools offer to consultant staff?

CDOT	None. Would be possible to grant access.
NCDOT	Vendors are not allowed to log on to NCDOT to track payments, but this may be possible in the future.
PDOT	ECMS allows the following functions to collaborate with their engineering partners: • Operates consultant agreements. • Bills plan specs and package. The system is linked to the e-bidding and can be used to download plans. • Electronic repository stores files (images). • At the beginning of a project, consultants develop a work breakdown structure. During the course of the project, invoices are submitted against the original work breakdown structure. Consultants access ECMS through the Internet using a secure ID and password. Consultants enter the amount, period, and work performed according to the work breakdown structure.. The entire system was cumbersome to configure. The first module of the system was electronic bidding, which went live in 1996. The invoicing capability was implemented in 2000. The current system includes construction payments, invoicing, programming, electronic repository, and consultant agreements. Struggling with having a common architecture.
NYDOT	From a consultant staff perspective, the RoboBill program basically offers a way of checking an invoice before it is submitted to NYDOT. Most consultant firms have

	some type of electronic payroll system that they use to gather the information needed to go into the RoboBill program. Not aware of any electronic linkages that have been developed between a payroll system and the RoboBill program that would eliminate the need for re-entering data. Most people perceive an electronic invoice as a means of speeding up payments. Under the current system, the state of New York has a set number of days to pay a consultant, contractor, or vendor after they have submitted an invoice. It is my understanding that the Office of the State Comptroller does not send a payment out until the last day possible as a way of managing the state's cash flow. The practice of making payment on the last date possible diminishes the electronic invoices as a means of speeding up payments. Consultants and other vendors in New York have the option of having payments made with a paper check or an electronic deposit into their bank accounts. Selecting the electronic deposit option has enabled consultant firms to receive their payment several days earlier than the paper check option.
Florida	View current contracts, submit and track invoices, and specify return address
Maine	Does not use electronic invoicing.
URS	Does not use electronic invoicing
Carter and Burgess	It would be a huge time saver and help speed up the payment process.
Louis Berger Group	Does not use electronic invoicing.

Virtual Teaming

1. What technology is used to meet and collaborate with remote team members?

Arizona	Videoconferencing is available in six locations throughout the state: Phoenix, Tucson, Flagstaff, Prescott, Yuma, and Globe. Two systems are available: Vtel NTC 2000 and ESA room system. There are three ISD lanes from Qwest. Full motion picture up to 384 kbps can be transmitted. Elmo can be used to switch to view documents. A personal computer in each unit is available to view presentations (PPP).
CDOT	Currently, Colorado does not have a formal virtual teaming system to collaborate with remote team members other than e-mail and sharing files across internal servers. The department is implementing ProjectWise. Currently, private firms or external parties do not have access to ProjectWise. Phase 2 will grant access to private firms. An FTP site is used to share files. Videoconferencing is setup at headquarters, though it is not heavily used, and is not a common practice.
NCDOT	Videoconferencing is done only within NCDOT using DTEL NTC 2000. Community colleges and department buildings are connected. Consultant can connect but there is a charge. Free to use for any agency.
PDOT	Did a review and selected Welcome Corp. “Open Plan” for scheduling. Welcome Home is a Web coral that allows for collaboration between team members. A big benefit is that common schedules can be updated. Used to schedule via e-mail, which was often cumbersome. Now, all team members have access. Consultants have access through ECMS. Once they are in Welcome Home, they can see the schedules. Videoconferencing capability linking all 11 districts. Contact Ronald Klose (717) 787-4836.
NYDOT	Bridged conference calls. The Office for Technology Telecommunications offers agencies a state-of-the-art audio teleconference and bridging service. The conference call bridge has been developed to meet the telecommunications needs of our customers by currently accommodating three to 217 participants. Users can access the conference call from anywhere through use of a secure call access code. It is available 24 hours a day, seven days a week. This facility saves time and money (lower rates then services offered by AT&T and MCI), reduces travel time, and is designed as a quick tool for disseminating information. An outline of the services and features are as follows: • Passcode conferences. • Event conferences. • Immediate call placement. • Interstate, intrastate and national conferences.

	• No set up fee. • Free cancellation with 24 hour notice. • Entry and exit tones. • Attendee announcement upon entry. • Economical rates.
Florida	CADD desktop support is done via Microsoft NetMeeting.
Louisiana	Deploying videoconferencing statewide: Lotus Sametime. There are nine district offices and all have videoconferencing. In Baton Rouge, there is a training facility (the materials lab) with one. Traffic services and headquarters have three more. (There are 15 total.) Part of the internal network. In addition, Web cast (similar to NetMeeting) is available, which allows staff to hold a remote meeting without having to book a meeting room. Ability to ask questions during the session. Sessions are scheduled and participants join through a Web browser.
Maine	Two things: Web conferencing and telephone conferencing through Premier company. WebEx customized. Recently installed videoconferencing from Policom. Set up in headquarters and six regional offices. WebEx allows the screen to be shown while on the phone. Primarily internal but could be used with other parties with the right technology. Videoconferencing uses a video camera to see people and applications. It is a scarce resource. Both new tools. Web conference for six months and video conference six months.
URS	Videoconferencing and/or conference calls.
Carter and Burgess	Web sites, FTP, e-mail, phone, travel.
Louis Berger Group	Given its operation as an international E/A consulting organization, Berger managers occasionally utilize videoconferencing (such as NetMeeting or WebEx) to communicate with project personnel or teams.

2. What tools are currently used to schedule meetings and events internally and externally?

CDOT	Microsoft Office used for internal scheduling. No external.
NCDOT	MS Office?
PDOT	Welcome Home is a Web coral that allows for collaboration between team members. One of its benefits is that common schedule can be updated. Scheduling used to be done via e-mail, which was cumbersome. Now, all team members have access. Consultants have access through ECMS. Once they are in Welcome Home they can see the schedules Joint Permit Application expert system (JPA): This system helps users prepare, submit, and review waterway permit applications for highway and bridge projects. System features include: • Automating administrative procedures. • Programmed rules, guidelines, and checklists. • Reducing paper. • Enabling a workgroup environment. • Providing mobility and wide availability.
NYDOT	Bridged conference calls, plus plans to have videoconferencing and other capabilities.
Florida	Lotus Notes as its solution for internal e-mail, calendaring, etc. Communication bridges support teleconferences. Phones are used to arrange special meetings with external participation.
Louisiana	Not a standard. Internally uses Lotus Notes, and Domino (Web component) is the collaboration tool. Online calendar. You can specify that team members look at their availability and also room availability. Participants have to accept. It is possible to grant access to engineering partner because of policy security. It would be possible to allow access to consultants by setting up a server outside the firewalls. The problem is that it would be vulnerable to attack, lack of security. First firewall only allows http in. sysco pix. There are two firewalls and between them are the servers.
Maine	Internally MS Project, Outlook, and an Exchange server. External phone and e-mail. When dealing with videoconferencing there are coordinators and there is help for the intranet.
URS	Lotus Notes e-mail for this. Can schedule meetings and invite people either externally or internally.
Carter and Burgess	Web sites, e-mail – meeting schedulers. Both C-B and UDOT project mangers can tap into UDOT server and schedule meetings directly in the UDOT system. UDOT has a separate server just for GroupWise.
Louis Berger Group	Microsoft Outlook.

	Project Web sites are typically designed and implemented by Berger.

3. How are documents shared/viewed during virtual collaborations?

Arizona	Full motion picture up to 384 kbps can be transmitted. Elmo can be used to switch to view documents. A personal computer in each unit is available to view presentations (PPP).
CDOT	None until ProjectWise will allow simultaneous file viewing.
NCDOT	Users can view the remote computer's screen. It is possible to view any type of documents.
PDOT	There is a utility to track version control. It is part of ECMS (Visual Basic, Domino). CAD files are shared internally using a separate server. External users have access to large files through ECMS.
NYDOT	Not possible at the present time.
Florida	Shipped via e-mail, shared desktops via NetMeeting. The department also has an internal Enterprise EDMS. Not sure of the extent of the support for virtual collaborations by EDMS.
Louisiana	Internally, top of the line e-mail. There is a departmental intranet. There is a bulletin board.
Maine	For Web conferencing there is a utility to share documents. The video has provisions to view documents on screen. E-mail or FTP for files.
URS	Either Buzzsaw or e-mail documents in advance.
Carter and Burgess	Via Web sites, FTP, e-mail, fax, or hand delivery, usually a PDF format.
Louis Berger Group	WebEx and NetMeeting.

4. Do the existing information systems/tools adequately support your collaboration needs? Why or why not?

Arizona	No. Not enough coverage. Videoconferencing is not heavily used indicating that staff does not have access, they do not know they can use it, it does not support their collaboration needs, or they do not know how to use it. Private company provides support at each location. Required training is minimal.
CDOT	No, until ProjectWise is implemented.
NCDOT	N/A
PDOT	Yes.
NYDOT	No, it is not possible for remote parties to simultaneously view a document.
Florida	Yes, but we are continually looking at new and better ways to collaborate with our external production partners. Homeland security, network security, and bandwidth place limitations on what we can do.
Louisiana	A benefit would be to have standards (calendars). Now it is not required.

Maine	Yes, for current needs. With a new system it is hard to tell. There is a limited number of conference rooms.
URS	Right now, what we are using is adequate for the projects we are involved in.
Carter and Burgess	They work for the most part, depending on the scale of the project. Videoconferencing would be nice, however it would be too costly to implement.
Louis Berger Group	Yes.

5. What current improvement initiatives are planned or underway?

Arizona	They want to expand the number of locations. One limitation is the availability of ISD at those locations. Audio conf or go to town or go to a location where is available.
CDOT	Implementing ProjectWise.
NCDOT	N/A
PDOT	No planned improvements on virtual teaming.
NYDOT	Future services and enhancements soon to be available: • Videoconferencing. • Webenabled scheduling. • Operator-attended conference calls.
Florida	Internally looking at expanding the Enterprise Information Portal to allow easier query of data systems.
Louisiana	Content streaming (server to store video content). The hardware is in place
Maine	Still in the implementation phase of getting current tools.
URS	None at this time.
Carter and Burgess	Better, faster collaboration Web sites, that allow everyone to update and keep updated. Possible PDA and cell phone updates. Still looking at ideas on this internally.
Louis Berger Group	None.

Sharing Project Documents

1. How are "as built" developed and retained?

CDOT	Someone on the construction project team red marks hard copies and stores them at headquarters. In the future, a combination of ProjectWise and redline will be used.
NCDOT	Steve Dewitt.
PDOT	N/A
NYDOT	As-builts are developed both manually and utilizing computer software. Final paper versions are produced. These paper documents are then photographed and microfilm produced in duplicate. The microfilm is permanently retained as the official as-built record.
Florida	Scan the marked paper documents into the construction portion of the Enterprise EDMS system for all projects except Category II structures, the as-builts for which will be done electronically from the native .DGN (MicroStation) files. Access to these will be made available from the Enterprise Information Portal.
Maine	Implanting electronic plans archiving system based on iPlot. Have a contract to scan plans that old and row plans will be scanned. 23,00out 150,000 in the system. Mixed situation on how are they developed.
URS	We receive as-builts from a contractor on paper and we update the design documents per their changes.
Carter and Burgess	We gather the latest standards from the UDOT Web site (which needs a more central location for items, along with documentation). We then design according to standards, and create drawings, etc. in standard directories. Print via iPlot PRO creating both digital and hard copy of the files. Burn everything to a CD and submit hard copies and CD to the project manager along with posting on UDOT's electronic file room. All files are backed up nightly internally.
Luis Berger Group	N/A

2. Please describe any existing electronic information sharing with engineering partners.

CDOT	In the process of implementing ProjectWise. It was chosen because we needed something to share documents. Good integration with MicroStation. The estimated cost is $60,000 for implementation, $200,000 for software and four internal staff. Decided not to use iPlot due to the complexity of setting it up and the servers required.
NCDOT	It is a common practice to use FTP to share all documents related to a project.
PDOT	Small documents are shred via e-mail. Large files are shared through ECMS, which has an electronic repository capability.
NYDOT	NYSDOT utilizes the ProjectWise file management application from Bentley Systems. This application is server based and runs across our entire internal statewide network. It is used to store and manage all of our data and documents that pertain to all capital projects, both in Design and Construction. There is a Web

	interface that allows us to share electronic project data over the Internet with consultants, contractors, municipalities, and review agencies, as well as our remote construction field offices. These outside groups log on with a user name and password, and can view the documents to which we have granted them access to see, or they can check out or deposit files with the system. During the period from advertisement to letting: (1) bidding data is shared via the Internet with Trns•port® Expedite; and, (2) we are piloting the distribution of the our bid documents (i.e., plans, proposals and amendments) on CD.
Florida	Those partners with valid logins to the department's network have access to the data they need to do their jobs. Other sharing is done via e-mail or FTP sites that sit outside the department's network firewall.
Maine	Specs for data exchange are sometimes followed and sometimes not. We share information at all stages.
URS	Used Buzzsaw as a project collaboration tool on several projects. Post the drawing or documents on the project site and notify those who need access to the information.
Carter and Burgess	FTP sites, internally written file sharing programs that allow for check-in/check-out of files, e-mail, and VPN tunnels for collaboration.
Louis Berger Group	Corporately, Berger utilizes a secure electronic network environment consisting of designated project folders to share project files. For project teams with personnel in separate locations, FTP sites on the Internet are used to manage and share project information. Berger staff who ar on a client site typically utilize the client's collaborative program/project Web site to share project information. For example, on the World Trade Center Transportation Hub and Site Redevelopment projects, Berger staff use a program Web site and its built-in electronic document management system, Livelink, to manage and share project information, including both sensitive and non-sensitive information.

3. What steps are taken to prevent duplication of documents and drawings?

CDOT	Hard copies. E-mail potential for version control.
NCDOT	N/A
PDOT	There is a utility to track version control. It is part of ECMS (Visual Basic, Domino).
NYDOT	Our use of ProjectWise eliminates most duplication of files by managing the sharing of access to one original file. Read and write access can be set for each person accessing each file, and only one person can have write access at any one time (check-in/check-out). We have also developed engineering data standards and procedures to help insure the integrity of the data.
Florida	Internal CADD production utilizes a product from the Giffels Group called TIMS (Technical Information Management System). This product supports file check-in/check-out during the production process to avoid overwriting of files. Other products may be used in the EDMS environment. Use the OIS link previously given to research this further.
Maine	Some of the standardization.
URS	All the current files reside on the Buzzsaw site, and they are checked out when the files are being worked on. In addition, permissions are set for the folders to prevent

	others from overwriting files.
Carter and Burgess	Trying to get a virtual site created to allow better tracking of documents for check-in/check-out. This will only allow for original drawings or documents to be edited by one person. Clients will have access.
Louis Berger Group	Berger staff who are on a client site typically utilize the client's collaborative program/project Web site to share project information. For example, on the World Trade Center Transportation Hub and Site Redevelopment projects, Berger staff use a program Web site and its built-in electronic document management system, Livelink, to manage and share project information, including both sensitive and non-sensitive information.

4. What technologies are used to share and manage project documents?

CDOT	Will be ProjectWise. Each region has a server eng store files, there is no backup no centrally get backup but eng do not always backup.
NCDOT	FTP for external, servers for internal.
PDOT	E-mail for small documents and internal server for large files
NYDOT	See Question 2.
Florida	See Question 2.
Maine	We do not have a document management syste, though we do have a TEDOCS retrieval system. Everything is scanned and indexed. There is an initiative to move to a document management system. Entirely internal. Use e-mail or CD for external. In one project, there was collaboration Bentley VCON. State FTP site. Permission makes it awkward to use.
URS	See Question 3.
Carter and Burgess	Internally, give security access to different offices to the same files, so everyone works on the latest document and not a duplicate.
Louis Berger Group	Livelink (Calligo), Secure Network folder systems, Primavera Expedition, FTP sites, e-mail.

5. What technologies are used to share and manage design documents?

CDOT	Will use ProjectWise.
NCDOT	N/A
PDOT	ECMS.
NYDOT	See Question 2.
Florida	See Question 2.
Maine	We do not use anything. We have a standardized project folder structure for each CAD project. Maintained in their server. Mater copy in their server. On MicroStation drafting work with master copies. Regional copies sometimes work on copies on local pc. Mc briefcase to update copies of draw. Have standardization on naming.
URS	See Question 3.

Carter and Burgess	FTP, Virtual Private Network, e-mail.
Louis Berger Group	FTP, e-mail, project Web sites.

6. How are large files shared? Are there bandwidth issues?

CDOT	FTP site. Inside network.
NCDOT	FTP.
PDOT	ECMS – electronic repository.
Louisiana	Regional offices with a T1 connection are allowed to access the server with large files.
NYDOT	Large CADD files have not presented a problem for us internally. Our ProjectWise system is set up with data storage at each of our 11 remote Regional Offices and at our Main Office, and we have the application server and Web server in our Main Office. Our internal network utilizes T1 trunk lines, so bandwidth has not been an issue. Our external users may encounter bandwidth slowness, but that is more of a factor of what their upload/download capacities are on their networks.
Florida	FTP, nothing-real time, except for maybe using NetMeeting in a support-type situation.
Maine	Usually, CD or FTP transfers when too large for e-mail. Bandwith can be an issue. We have a fast Internet connection.
URS	Large files are usually placed on a CD or DVD and sent by mail. Bandwidth is always an issue. All members of the project team have different connection speeds and it greatly affects their willingness to collaborate electronically.
Carter and Burgess	Extremely large files are usually shared on a CD (usually as TIFF files or some sort of picture); it is ok to have multiple copies. If they are not shared on CD, then there are bandwidth issues, and it requires users to download to their local machine to speed things up.
Louis Berger Group	FTP sites and project Web sites

Project Management Tools

1. What project management tools are currently used at your organization?

CDOT	ERP based on SAP. Microsoft project sporadically for detail schedule. When a contractor develops schedules, they are not required to use specific software. ERP has a scheduling system. Outlook might or might not share. Promis (accounting) and Prodits (schedule), our in-house developed programs, will be replaced by ERP. Some people use Primavera.
NCDOT	Project Management and Maintenance Initiative (PMMi), which is an implementation of SAP. Not accessible to consultants. Has the same templates as Open Plan.
PDOT	ECMS uses Open Plan. The PENNDOT Open Plan 3.0 (OP30) Templates file provides project managers with a toolset that they can use to start developing a project schedule. The package is comprised of the following: • Project templates – The project templates were designed as an 80 percent solution. The project manager would have to use the unique project requirements and his or her own experience in developing the schedule. • View templates – PENNDOT view templates are attached to each project template. A view template displays activities within the project in different formats. For example, there are view templates for Gantt charts, network diagrams, and schedule variances. View templates often use a customized filter and/or sort in order to display the activities (e.g., the PENNDOT Barchart with Activity Target Filter). • Auxiliary files – Auxiliary files include the work breakdown structure (WBS_2000) and organizational breakdown structure (OBS) code files, the PENNDOT default calendar file (PDCAL), and the PENNDOT resource file (PDRES).
NYDOT	Microsoft Project.
Florida	http://www.dot.state.fl.us/ProjectManagementResearchDevelopment/.
Louisiana	The department uses Primavera as an engine for PPMS. SureTrak is a light version of Primavera. Also MS Project for small projects. LETS helps develop their annual program. It is a milestone. For planning purposes. It is a secondary scheduling tool. Pmms had the budget process. Currently moving to PMMS because of accountability. Can track expenditures, personnel assigned, multiproject scheduling.
Maine	ARTIMS Automated Project View. Used in conjunction with Promis (funding and scheduling system). Have interface Projex ties APV with Promis mainframe. This allows maintaining scheduled and budgets. These are scheduled before they go to construction. During construction, they are not that concerned with the schedule.
Washington	Scheduling is done using PS8 (by Sideforma). The Urban Corridor Office uses Primavera. WS Ferries also uses Primavera. PS8 is relatively new and has only

	been used for 18 months.
URS	Primarily use Microsoft Project on all CDOT projects, but have used Primavera when the project calls for it.
Carter and Burgess	Microsoft Project, SureTrak, P3 (Primavera), Microsoft Excel spreadsheets, and internal project manager Websites, with access to financial systems.
Louis Berger Group	The Louis Berger Group, Inc. utilizes a wide array of project management tools. Following is a list of some of the typical systems, applications, software, and products utilized in project management: CPM Scheduling: • Primavera P3, P3e. • SureTrak. • Microsoft Project. Cost Management and Cost Estimation: • Microsoft Excel. • Microsoft Access. • Prism (Ares Corporation). • ProLog (Meridian Systems). Change Control and Requests for Information/RFIs/Submittal Management: • Primavera Expedition. Electronic Document Management: • Livelink (Calligo). • Secure Network folder systems. • Primavera Expedition. Digital Photo Management (e.g., for construction progress, claims prevention): • Cumulus 8.0. • Lynx. Collaborative Project Management Systems: • Custom designed systems using commercially available, off-the-shelf software (COTS). • Constructware. • ProLog (Meridian). GIS: • ArcGIS 9.0. CADD: • AutoCAD 2004. • MicroStation 8.0. Organization Charting, Work flow and, Process diagramming: • Microsoft VISIO Pro 2003.

	Project Reporting and Documentation: • Microsoft Word. • Microsoft Excel. • Microsoft Publisher. • Crystal Reports. Communications and Calendar Management: • Microsoft Outlook. • Project Web sites, typically designed and implemented by Berger.

2. More specifically:

- How are project schedules and budgets tracked and managed?
- How is project resource loading performed?

CDOT	Through the Prodate (schedule side) and Prmis (budget side), all released by SAP
NCDOT	PMMi schedule includes resource loading. Project accounting system (SAP) budget.
PDOT	Not included.
NYDOT	MS Project.
Louisiana	PMMS, LETS, and MS Project. Resource loading, although possible, is not a common practice.
Maine	Some project managers have up to 60 projects resource allocation not done
Washington	Schedule tracked by project teams, varies from region to region. Updated at inconsistent times. In the Northwest region, they have monthly confident reports; schedules are updated before the meeting. The program management office tracks budget. Scheduling PS8 (Sideforma). Urban Corridor Cffice using Primavera. Ferries use Primavera although it has only been in use for 18 months. Budget - mainframe CPMS. Some people are doing resource loading using Primavera.
URS	For our budgets, we use E1 accounting system designed by JD Edwards. Resource loading is done using MS Project.
Carter and Burgess	Internal project manager Web site is remotely accessible, with security. Everyone is given different rights. General manager rights allow the user to change everything; project manager rights allow the user all rights to specific projects; task manager rights allow the user to create tasks and delegate resources to projects; user rights are basic rights that allow people assigned tasks to complete tasks delegated to them. This is all tied into the financial system, which gives project budget and amounts used or billed toward the project. This gives the project manager a more accurate

	look at what is going on. The project manager can also forecast with the site to see where resources are low and how to delegate things better. Working on tying the system into timesheets to help with redundant time entry. Invoices are generated through the financial system, which is all Web-based. Right now, there is no external communication with clients, other than via e-mail, on a large scale. A few Web applications have been developed for specific projects to allow project people to get in and look at project calendars, add to and delete from the calendar, setup meetings, etc. A problem has been getting people to use it. Most users are comfortable with e-mail.

3. How have these tools improved project management efficiency?

CDOT	Not yet implemented.
NCDOT	Getting consistent project control.
PDOT	It has made a substantial change in the way PDOT does business. It has improved communications and reduced times.
NYDOT	Yes.
Maine	Over the past three to four years, gone from nothing to a system that works.
Washington	Do not have measure for efficiency before and after. Too early to say.
URS	When they are used correctly, they are very efficient.
Carter and Burgess	By giving monthly reports of budget and resources to the project manager to view how and where the project sits in relation to a timeline.

4. Are project managers satisfied with these tools? What current improvement initiatives are planned or underway?

CDOT	Assessing project scheduling side. Implanting budgeting side.
NCDOT	PMII in production since July. Too early to say. The perception is a cultural change that represents a change and more work.
PDOT	Project managers are very satisfied with the system. All project managers are required by department policy to use ECMS. Smaller systems. Joint permit application to collaborate with the Department of Environment Protection. Looking at AASHTO software for cost estimation and bidding. Expedite and estimator.
NYDOT	NYDOT is currently evaluating Artemis 7 for increased functionality in the areas of program planning and resource management.
Maine	Yes. Satisfied with the tools. There is a project setup to replace Promis. Funded and schedule to begin this year (RFP).

Washington	No. Underway to redefine. They are in their first iteration. Add fields, reports. Would like to see simplification. Using a lot of fields for reporting not for scheduling. Satisfied wit the PS but would like improvements. A re-evaluation is to integrate and have portal for scheduling system and all tools. Tools are not organized in one central location. Use of the tools is not consistent. There has hot been a mandate. There is a lack of understanding on the scalability. Reluctance to use is small.
URS	No improvements are planned.
Carter and Burgess	Not completely; trying to come up with a live/real-time tool that can be viewed anytime, anywhere, and will be accurate to the day, which will enable project managers to better track budgets and resources.
Louis Berger Group	Yes.

5. What options do users, such as engineering partner project managers, have with accessing and modifying schedules? Does it generate automatic notification?

CDOT	N/A
NCDOT	Ask Bill Martin.
PDOT	No automatic notifications.
NYDOT	None.
Maine	There has been a lot of discussion about sharing with private firms. The control of the Web site has been centralized. There is an initiative to share the database live through the Web. There has been talk to extend to other things.
Washington	Yes, private firms have access to schedules. Have to get access to pass firewall. Depending on the permission, they can modify schedule. No automatic notification.
URS	The project manager can track and modify the schedule, but it does not have any automatic notification.
Carter and Burgess	Not possible at this time. Working on the capability to give real-time information, which would include generating schedule auto-notifications to mission-critical people.
Louis Berger Group	N/A

Interview Guide

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The Utah Department of Transportation (UDOT) has engaged Dye Management Group, Inc. (www.dyemanagement.com) to conduct a nationwide research and analysis study related to Electronic Collaboration and Information Sharing with Engineering Partners. The analysis and recommendations from this research will be used by UDOT to improve project management communication, allow for easier sharing of design data, reduce redundant and/or manual effort on the part of various stakeholders, and reduce administrative costs for both UDOT and its engineering partners.

As part of this project a series of interviews will be conducted, in which we are seeking information from your organization concerning the topics listed below:

- Electronic invoicing and payment.
- Virtual teaming (videoconferencing).
- Shared project documents.
- Project management tools.

Any questions concerning this survey should be addressed to:

Miguel Beltran (miguel@dyemanagement.com), Dye Management Group, Inc., (425) 637-8010

INTERVIEW QUESTIONS

Electronic Invoicing and Payment

1. What tools are used to expedite the electronic invoicing and payment process for consultant progress payments?

2. To what extent is the electronic invoicing and payment system used by consultants or other external staff?

3. What capabilities do these systems and tools offer to consultant staff?

Virtual Teaming

1. What technology is used to meet and collaborate with remote team members?

2. What tools are currently used to schedule meetings and events internally and externally?

3. How are documents shared/viewed during virtual collaborations?

4. Do the existing information systems/tools adequately support your collaboration needs? Why or why not?

5. What current improvement initiatives are planned or underway?

Sharing Project Documents

1. How are "as built" developed and retained?

2. Please describe any existing electronic information sharing with engineering partners.

3. What steps are taken to prevent duplication of documents and drawings?

4. What technologies are used to share and manage project documents?

5. What technologies are used to share and manage design documents?

6. How are large files shared? Are there bandwidth issues?

Project Management Tools

1. What project management tools are currently used at your organization?

2. More specifically:

   - How are project schedules and budgets tracked and managed?

   - How is project resource loading performed?

3. How have these tools improved project management efficiency?

4. Are project managers satisfied with these tools? What current improvement initiatives are planned or underway?

5. What options do users, such as engineering partner project managers, have with accessing and modifying schedules? Does it generate automatic notification?